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OF THE
ENGLISH LANGUAGE

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THIRTY VOLUMES
ILLUSTRATED

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No. 1.

SCHEME OF SOUND SYMBOLS

FOR THE PRONUNCIATION OF WORDS.

Note.—(-) is the mark dividing words respelt phonetically into syllables; (′), the accent indicating on which syllable or syllables the accent or stress of the voice is to be placed.

Sound-symbols employed in Respelling.	Representing the Sounds as exemplified in the Words.	Words respelt with Sound-symbols and Marks for Pronunciation.
ā	mate, fate, fail, aye	*māt, fāt, fāl, ā.*
ă	mat, fat	*măt, făt.*
â	far, calm, father	*fâr, kâm, fâ′thėr.*
ä	care, fair	*cär, fär.*
aw	fall, laud, law	*fawl, lawd, law.*
ē	mete, meat, feet, free	*mēt, mēt, fēt, frē.*
ĕ	met, bed	*mĕt, bĕd.*
ė	her, stir, heard, cur	*hėr, stėr, hėrd, kėr.*
ī	pine, ply, height	*pīn, plī, hīt.*
ĭ	pin, nymph, ability	*pĭn, nĭmf, ă-bĭl′ĭ-tĭ.*
ō	note, toll, soul	*nōt, tōl, sōl.*
ŏ	not, plot	*nŏt, plŏt.*
ô	move, smooth	*môv, smôth.*
ö	Goethe (similar to *e* in her)	*gö′tėh.*
ow	noun, bough, cow	*nown, bow, kow.*
oy	boy, boil	*boy, boyl.*
ū	pure, dew, few	*pūr, dū, fū.*
ŭ	bud, come, tough	*bŭd, kŭm, tŭf.*
ú	full, push, good	*fúl, púsh, gúd.*
ü	French plume, Scotch guid	*plüm, güd.*
ch	chair, match	*chär, măch.*
ċh	German buch, Heidelberg, Scotch loch (guttural)	*bôċh, hī′dėl-bĕrċh, lŏċh.*
g	game, go, gun	*gām, gō, gŭn.*
j	judge, gem, gin	*jŭj, jĕm, jĭn.*
k	king, cat, cot, cut	*kĭng, kăt, kŏt, kŭt.*
s	sit, scene, cell, city, cypress	*sĭt, sēn, sĕl, sĭt′ĭ, sī′prĕs.*
sh	shun, ambition	*shŭn, ăm-bĭsh′ŭn.*
th	thing, breath	*thĭng, brĕth.*
th	though, breathe	*thō, brēth.*
z	zeal, maze muse	*zēl, māz, mūz.*
zh	azure, vision	*ăzh′ėr, vĭzh′ŭn.*

GALVANIZED IRON: iron in sheets or other forms coated with tin by a galvanic process, and then with zinc by immersion. The sheets or other articles to be galvanized are first treated to a dilute acid-bath to remove all rust or scale, which process is called 'pickling'; they are then washed and scoured and transferred to a large wooden bath. On the bottom of the bath is first placed a layer of finely granulated zinc, then a sheet of the iron, then another layer of granulated zinc and so on as far as convenient. Into the bath is now poured a diluted solution of chloride of tin, and the current passed through, so that by means of the galvanic action produced the tin is thinly deposited over the iron. The tin-coated iron is now ready for the zinc coating. Molten zinc is poured into a receptacle and covered with ammonium chloride (sal-ammoniac) mixed with some earthy material. This forms a viscid layer over the metal and prevents its rapid oxidation. Into the molten zinc the iron is plunged, and, in the case of sheets, is passed through iron rollers. The zinc coating thus received completes the process. With a great deal of the galvanized iron, the preliminary tin-coating process is dispensed with, and the iron is simply treated with the molten zinc as described above. Although such material is termed galvanized iron, there is no recourse whatever to galvanic action in its preparation, and the name is improperly applied.

Telegraph wire is coated with zinc entirely by machinery. The iron-wire from the drawing-mill is passed through a pipe kept at white heat by means of a furnace, this furnace having a row of such pipes set like the tubes of a boiler, but all at the same level. On emerging from the tube the wire is at dull red heat and is passed through dilute hydrochloric acid into the zinc bath, the whole process being continuous.

The uses of G. I. are very varied and too numerous to mention. In plain or corrugated form it is an important article for construction purposes; a large quantity is used for wire-ropes, netting and the like, and in a great variety of objects, it has replaced wood, copper, brass, slate, etc.

The origin of galvanized iron is somewhat obscure for the idea has had many claimants. It is said that the Frenchman, Malouin, as long ago as 1742 knew of a plan for coating iron with zinc. Bishop Watson in his *Chemical Essays* published in 1786 states that a method of zincing iron was then employed at Rouen for coating hammered-iron sauce-pans with zinc, and he gives some details of the process. Patents for a galvanized-iron process were issued to H. W. Craufurd in 1837, and to E. Morewood in 1841.

GALVANOMETER: see ELECTRICAL MEASURING INSTRUMENTS.

GALVESTON, *găl'vĕs-ton*, city, port of entry, and cap. of Galveston co., Texas. It is situated on Galveston island at the mouth of the bay of the same name, and has for railroad connections the Missouri, K. & T., the A., T. & S. Fé, the Int. & Gt. Nor., the So. Pac., the Galveston, Houston & Henderson, and the Gulf & Interstate railroads. Galveston is the natural port of entry for the great Southwest, and during the last few years it has advanced from fourth to third place in its rank among the exporting ports of the U. S. There are 53 lines of steamships plying between Galveston and foreign ports, and in a single year it more than doubled its coastwise trade. The domestic exports are cotton, wool, hides, oil cake and oil meal, cottonseed oil, fish oil, cement, and poultry. The domestic imports are drugs, boots and shoes, hats, dry goods, chemicals, and similar commodities. The foreign exports are the same as the domestic, with the addition of wheat, corn, flour, copper, and iron ores, cattle, lumber, timber, and provisions; and the foreign imports include fire-brick, tiles, chemicals, cement, liquors, earthenware, prepared vegetables, and fancy woods. There are 6 miles of completed wharfage covered with sheds, and a railroad trackage system covering about 50 miles. The city has over 30 churches for white people and 12 for colored orphan asylums, a home for homeless children, and a home for aged women; the School of Medicine of the State University, 12 private or sectarian schools, a Roman Catholic Univ., 2 Roman Catholic academies, a business college and public high school, and 5 graded schools for white children, 1 high and 2 graded schools for colored children, a library building, which cost $150,000 with an endowment fund of $400,000, a Masonic temple, and a Scottish rite cathedral. There are both private and national banks, and many building, loan, abstract, and real estate corporations. The water-works, fire department, sewer system, and street electric plants are owned by the city. The water-works plant is valued at $1,500,000, and the supply of water comes from artesian wells on the mainland, piped under the bay. There are daily and weekly papers, many hotels, thoroughly-equipped hospitals, several bagging mills, rope works, brewery, cement,

GALVESTON IN 1850.

and pipe works, ice plants, iron works, sash, door, and blind manufactories, cotton presses, clothing, cotton oil, flour, meal, coffee, baking powder, spices, extracts, pickles, preserves, macaroni and mineral-water manufactories, and rice mills. The rate of taxation for the city is $1.88 on the $100, and for county and state, $1.44. About 1782 a Spanish fleet, while making an examination of the coast west of the Mississippi river, named Galveston bay and island in honor of Conde de Galvez, then governor of Louisiana (1780–85). One white man was found on the island at the time, who lived by hunting and fishing, and the locality had long been a favorite resort of the Caroñkawas Indians, the once powerful and warlike tribe who inhabited so much of the coast of Texas. No effort to occupy the place was made by white men until 1816, when a garrison of about 200 men was established there by the revolutionists of Mexico. They soon abandoned the island, and it was immediately afterward occupied by Lafitte the pirate, who made it his general headquarters until about 1826. During this time a settlement was established which, in 1817, numbered nearly 1,000 inhabitants; but after the withdrawal of Lafitte the place was abandoned, and nothing further is known of it until sometime in the thirties, when the Mexican govt. established a custom house on the island. During the war for the independence of Texas the place became an important station for naval vessels, and the permanent settlement of Galveston may be said to date from that period (about 1836). It was incorporated as a city in 1839, the first mayor being John M. Allen. The county of Galveston was represented for the first time in the third house of representatives of the republic of Texas (1838) by Moseley Baker. From that time the place continued to thrive, until during the Civil war it had attained a position of prominence. On the 1st of Jan., 1863, the Confederate forces under Magruder won a victory over the Federal land and naval forces; on Jan. 11, the *Alabama* sank the *Hatteras* outside the harbor, and on Jan. 21, the blockading gunboats *Velocity* and *Morning Light* were captured with large stores of ammunition and supplies. Galveston remained in Confederate possession till the close of the war. On Sep. 8, 1900, Galveston was visited by the most destructive storm and tidal wave in the history of the U. S., causing a loss of life in the city of about 6,000, and from 1,000 to 2,000 more perished in the adjacent country. The loss of property was estimated at nearly $20,000,000. Following this catastrophe the state legislature placed the city under the government of a commission, which has proved highly satisfactory, the expenses of the municipal administration having been reduced to the extent of nearly $100,000 a year. Since its creation the commission has been steadily reducing the floating debt of the city; it has rebuilt the city hall and water-works pumping station, which were destroyed by the storm, and repaired other city property; a new engine house has been

built; the streets in the business section have been repaved with brick at a cost of $125,000, and more than $35,000 have been expended on rock and shell roads; old judgments against the city amounting to many thousands have been paid, and a part of the bonded debt retired. All this was accomplished without increase in the rate of taxation, and meanwhile all city salaries were paid in cash, without the necessity of borrowing so much as a single dollar. The legislature provided for the refunding of the bonded and floating indebtedness of the county, and authorized the issuance of bonds for breakwater and grade-raising purposes on the approval of two-thirds of the taxpaying citizens. Plans were perfected for the building of a seawall to cost $3,505,000, and the necessary bonds were promptly voted. The legislature also exempted all city property from the payment of state taxes for a period of 17 yrs., the amount being about $80,000 per annum, and this money is to be used in raising the grade of the city above the danger point from the sea. Work on the seawall was begun in Oct., 1902, and completed in 1905. The wall is 17,593 ft. in length, 16 ft. wide at the base, and 17 ft. high. It is claimed that the beach at Galveston is the finest in the world, being 30 m. in length and adapted to bathing, fishing, boating, driving, etc. The winters are semi-tropical, and the summers are tempered by the sea breezes until the climate is delightful all the year round. The annual average temperature is 69 deg.; average temperature for July, 84 deg., and the average temperature for Jan. 53 deg. The average annual rainfall is 46 in. Pop. (1910) 36,981.

GALVESTON BAY, an inlet of the Gulf of Mexico, extending northward from Galveston about 35 miles.

GALVESTON ISLAND, an island off the coast of Texas on the northeastern end of which is Galveston. Length, about 28 miles.

GALVESTON, Texas, JETTIES AT. The entrance to Galveston harbor was originally obstructed by an inner bar upon which the depth of water was 9½ feet and an outer bar with a depth of 12 feet. The Federal government adopted the jetty system for improving the entrance to this harbor. Two jetties have been constructed of sandstone riprap and are covered with granite blocks weighing from 5 to 12 tons each. The south jetty is 35,603 feet in length and the north jetty 25,907 feet in length. They are to be built to a height of 5 feet above mean low tide and are from 12 to 15 feet in width at the top with a slope of about 1½ feet to each vertical foot in depth. The distance between the shore ends of the jetties is about two miles, they converge until their sea ends are about 7,000 feet apart. The total cost of this great work amounted to several millions. The jetties, by confining the water, has increased the tidal scour and secured a depth of over 26 feet at mean low tide on both bars. These works were damaged by the hurricane of

1900, Sep. 8, but have been repaired with granite blocks of ten tons weight.

GALWAY, *gawl'wā:* maritime county of Ireland, province of Connaught, and, after Cork, largest of the Irish counties. S.w. from the Lough Corrib to the sea is the district called Connemara, which contains vast bogs, moors, lakes, and morasses, and presents a peculiarly bleak and dreary aspect. On the coast of Connemara, (*Cun-na-mar,* 'bays of the sea') and Iar-Connaught, there are more harbors for large vessels than on any equal extent of coast perhaps in Europe. The climate is mild and humid, but in low-lying localities, sometimes unhealthful. The richest soil is in the district between the head of Galway Bay and the Shannon. Agriculture and fishing are the general pursuits; kelp is largely manufactured; also woolens, linens, friezes, felt hats, are manufactured. Pop. about 200,000.

GALWAY: county town and parliamentary borough of Ireland, a seaport and county of itself, with an exclusive jurisdiction extending two m. on the n., e., and w.; at the mouth of the river Corrib, on the n. shore of Galway Bay (q.v.), 50 m. n.n.w. from Limerick, 130 m. w.s.w. from Dublin. It is built on both sides of the river, and on two islands in its channel, its parts being united by two bridges. It is connected with Lough Corrib by a canal, and forms the terminus of the Midland Great Western railway. A line of steamers for a time plied between Galway and N. America, seven days being the usual time for a fair passage. The old town of Galway is poorly built and irregular, and some of its older houses have a somewhat Spanish appearance, which is accounted for by the commercial intercourse at one time between Galway and Spain. One of the principal buildings of Galway is the parish church of St. Nicholas, founded 1320, in connection with which is an ecclesiastical body called the Royal College of Galway. The see of Enachdune, of which Galway formed a part, was united to Tuam 1324; but in 1484, Galway was constituted a wardenship, with a distinct jurisdiction, similar to that of an episcopal see. There are three monasteries and five nunneries; the Queen's College, opened 1849; Erasmus Smith's College; the county court-house; barracks, etc. Galway has numerous flour and other mills, also breweries, distilleries, foundries, etc., extensive salmon and sea fishing, a good harbor, with docks that admit vessels of 500 tons, and a light-house. The exports consist mainly of grain, flour, bacon, fish, kelp, and marble. Pop. 15,000.

Galway was taken by Richard de Burgo 1232, and the ancestors of many of the leading families now resident in this quarter settled here about that time. From the 13th till the middle of the 17th c., Galway continued to rise in commercial importance. During the latter part of the 17th c., it suffered considerably for its adherence to the

royalist cause. In 1652, it was taken by Sir Charles Coote after a blockade of several months; and 1691, July, it was compelled to surrender to General Ginkell.

GAL'WAY BAY: inlet of the Atlantic Ocean, on the w. coast of Ireland, between the counties of Galway and Clare. It is a noble sheet of water, and offers great facilities for an extended commerce. Great efforts were made to obtain a public grant for the construction of a harbor of refuge; and a company was formed, 1858, for the establishment of a transatlantic packet-service (see GALWAY—town). A series of misadventures, however, attended its efforts; and though something was accomplished the effect was transient, and Galway Bay relapsed into its former quiet. It is 30 m. in length from w. to e. and abt. 10 m. average breadth. At its entrance, and between the N. and S. Sounds, are the Islands of Arran.

GALYZIN, or GALIZIN, or GALITZIN, or GALLITZIN See GOLITZIN.

GAMA, *gâmâ'*, Dom VASCO DA: abt. 1460–1524, Dec. 24; b. Sines, a small sea-port of Portugal: discoverer of the maritime route to India. He early distinguished himself as an intrepid mariner; and after the return of Bartolommeo Diaz, 1487, from doubling the Cape of Good Hope, King João, seeking a proper man to undertake the discovery of a southern passage to India, fixed on Gama. The intentions of Joao were frustrated by death; but his successor, Manoel the Fortunate, fitted out four vessels, manned altogether with 160 men, and entrusted them to the command of Gama, presenting him at the same time with letters to all the potentates whom it was thought likely he might require to visit; among others, one to the mythical 'Prester John,' then supposed to be reigning in splendor somewhere in the east of Africa. The little fleet left Lisbon 1497, July 8, but having been tormented by tempestuous winds almost the whole way, arrived at the haven now known as Table Bay so late as Nov. 16; here they cast anchor for a few days. On Nov. 19 Gama, after encountering a series of frightful storms, and being obliged to sternly suppress a mutiny among his terrified crew, who wanted him to return to Portugal, sailed round the s. extremity of Africa, and touched at various places on the hitherto unknown e. coast. At Melinda, where he found the people far more civilized than he expected, he obtained the services of a well-educated pilot, native of Guzerat, in India, who seemed familiar with the astrolabe, the compass, and quadrant. Under his guidance, Gama struck out to sea, crossed the Indian Ocean, and arrived at Calicut, India, 1498, May 20. His reception by the ruler of Calicut (the 'Samudri-Rajah,' or Prince of the Coast, shortened into Zamorin) was not very favorable, nor did Gama's intercourse with him subsequently improve. The Arab merchants residing there were jealous of the new-comers, who might interfere with their monopoly of traffic, and

incited the Hindus against them. Other complications arose, and the result was that, on his departure, Gama had to fight his way out of the harbor. Satisfied with his discoveries, the Portuguese commander turned his course homeward, touched at several of the places that he had previously visited, and in 1499, Sep., cast anchor at Lisbon, where he was received with great distinction. High-sounding titles were conferred on him. He was allowed the rare privilege of prefixing *Dom* to his name, and obtained a large indemnity for his trouble, besides certain monopolies in the commerce about to be opened with India. King Manoel immediately dispatched a squadron of 13 ships, under Pedro Alvarez Cabral, to India, for the purpose of establishing Portuguese settlements in that country. In this they were successful in only a few places. At Calicut 40 Portuguese, who had been left behind, were murdered by the natives. To avenge this injury, and particularly to secure the Indian Ocean commerce, the king fitted out a new squadron of 20 ships, which set sail under Gama's command 1502. This fleet reached in safety the e. coast of Africa, founded the Portuguese colonies of Mozambique and Sofala, which still exist, and sailed to Travancore. On his way, Gama captured a richly laden vessel filled with Mussulmans from all parts of Asia, on their way to Mecca. He barbarously set it on fire; and all on board, amounting to about 300, were burned or slain, with the exception of some 20 women and children. What adds to the tragic character of this fearful incident is, that it occurred through a mistake. Gama confounded these Asiatic followers of the Prophet with the Moors of Africa, the hereditary enemies of his nation and proceeded to extremities on that assumption. On reaching Calicut, Gama, after a delay of a few days, bombarded the place, destroyed a fleet of 29 ships, and compelled the rajah to conclude a peace with suitable indemnification. This act of vengeance or of punishment, executed with prudence and determination, inspired the natives with fear of the power of the Portuguese, and contributed to confirm the alliances made with several of the native princes. So rapid had been Gama's proceedings, that in 1503, before the close of Dec., he was back in Portugal with 13 richly laden vessels. He was not, however, again employed for a period of 20 years; and it appears that Manoel, for some reason, failed properly to appreciate his great services. Meanwhile, the Portuguese conquests in India increased, and were presided over by five successive viceroys, while Gama was lying inactive at home. The fifth of these viceroys, however, was so unfortunate, that King João III., the successor of Manoel, was compelled to have recourse to the old hero; and 1524, bearing the title of viceroy, Gama set sail once more for the scene of his former triumphs with a fleet of 13 or 14 vessels. As he approached the coast of India, an unaccountable agitation of the water was observed by all. There was no wind to cause it, and the superstitious

sailors were greatly alarmed. 'Why fear?' said Gama: 'the sea trembles before its conquerors.' His firmness and courage succeeded in making Portugal once more respected in India; but while engaged in his successful schemes, he was surprised by death at Cochin. His body was conveyed to Portugal, and buried with great pomp. In the character of Gama, resolution was found combined with prudence and great presence of mind. His justice, loyalty, honor, and religious fervor distinguished him above most of the great navigators and conquerors of his time. His discovery of a passage to India almost vies in importance with the discovery of America by Columbus only a few years before. Consult Barros, *Decades*; Castanheda and Lafitau, *Hist. Conqu. Portug.;* Cooley, *Hist. Mar. Discov.;* Major, *Discov. of Pr. Henry of Portugal.* His achievements have been celebrated by his countryman Luiz de Camoëns in the *Lusiad*, to whose glowing representations Gama's fame owes something of its splendor.

GAMA GRASS, *gā'ma* (*Tripsacum dactyloides*): a very large, vigorous and productive perennial grass with many long and broad leaves like those of Indian corn. It is known sometimes as Sesame Grass. The flower spikes are from four to eight inches long, the upper portion staminate, the lower pistillate. It is said to have been named from a Spaniard who first attempted its cultivation in Mexico. Gama grass grows wild in a large part of the United States, and is found in many warm countries of the old and the new world, and is cultivated to some extent. It grows on both moist and dry land, roots deeply, has remarkable power of resisting drought, and frequently reaches a height of seven ft. Though coarse it is quite nutritious, and horses and cattle eat it readily either green or made into hay. If it is to be fed dry it should be cut before the seed stems are formed. Three or four cuttings can be made in a single season. The seed is deficient in vitality, and propagation is often effected by planting pieces of the roots, about two ft. apart in each direction, which soon take entire possession of the soil. Gama grass is particularly useful at the South, where some of the finer grasses which flourish in cooler regions cannot be readily grown.

GAMALIEL, *ga-mā'lĭ'ĕl* [Greek form of Hebrew *Gamli'el*, 'My Rewarder is God,' or 'Mine also is God'], known as Gamaliel the Elder, or Gamaliel I., and in the Talmud as Rabban Gamaliel: celebrated Hebrew Rabbi of the 1st c.: doubtless the one mentioned Acts, v. 34; xxii. 3. Both here and in the Talmudical writings, he appears only in his capacity of a teacher of the law, and a prominent Pharisaic member of the Sanhedrim (q.v.); but of the circumstances of his life, or the date of his birth and death we learn nothing from these, the only sources. He was the son of Simeon, the same, it may be assumed, who was first honored by the title of Rabban (our master)—a mark of distinction afterward bestowed on Gamaliel him-

self—and thus was the grandson of the celebrated Hillel. Whether (as would follow from Pesachim 88 b.) he actually presided over the Sanhedrim in the reigns of Tiberius, Caligula, and Claudius (of which there is no historical proof, and not even any probability), certain it is that the laws and ordinances issued by that body during his life bore the stamp of the all-embracing humanity and enlightened liberality which from the 'regal' House of Hillel were transferred to the School of Hillel—principally as opposed to the particularizing and austere school of Shamai. To the refinement and erudition hereditary in his family—to which, alone, on account of its exalted position, even the otherwise strictly forbidden study of Greek science and philosophy had been allowed (cf. Derech Eretz, iv.) Gamaliel appears to have added a rare degree of discretion, and of that practical wisdom which betimes revokes or adapts social laws, according to the wants of the commonwealth. For the benefit of sufferers of all kinds, that most stringent law of the limited Sabbath-day's journey was relaxed; the license hitherto allowed to the absent husband, of annuling his letter of divorce (if he regretted his rashness), even after its delivery, before any court of two or of three men, was abolished (Gittin 32); while, on the other hand, to prevent confusion, prepense or involuntary, the strictest accuracy with respect to the names of the husband, wife and witnesses contained in these documents was rigorously enforced. Again, the widow was to receive her marriage portion (Kethuba) from the recalcitrant heirs, simply on her asseveration that she had not received it during her husband's lifetime: while formerly she had not been permitted even to make oath in the matter (Gittin, 34). But no less important, and testifying, at the same time, to a spirit free from prejudice, are the other laws respecting the treatment of the Gentiles, which may properly be ascribed to Gamaliel's influence, and were perhaps inaugurated by him. Gentile and Jew, it was enacted, should henceforth, without distinction, be allowed the gleanings of the harvest-field; even on the day specially set aside to his idol-worship, the former should be greeted with the salutation of peace. Of his poor, the same care was to be taken; his sick were to be tended, his dead to be buried, his mourners to be comforted, exactly as if they belonged to the Jewish community (Gittin, 59 b., 61 ff.; Jer. Gitt. c. 5)—certainly no mean tribute to the principle of the equality of the human race, and a practical carrying out of Hillel's motto, the words of the Scripture (Lev. xix. 18), 'And thou shalt love thy neighbor as thyself' (cf. Sabbath, 30 b. ff.). The consideration of these and other legislative acts, all tending toward that social improvement and consolidation (*Tikkun Haolam*) which was Gamaliel's avowed and acknowledged aim, seems also to set at rest that old and barren dispute, whether Gamaliel, when he interposed on behalf of the apostles, and referred their matter to God himself, was secretly a Christian, or whether he was 'a cowardly tyrant

who even sought to withhold from them the privilege of martyrdom.' Tolerant, peaceful, as free from fanaticism on the one hand, as on the other from partiality for the new sect, which he seems to have placed simply on a par with the many other sects that sprang up and disappeared in those days: he exhorts to long-suffering and good-will on all sides. For his relation to the apostle Paul, and for the 'Law' that he taught him (Acts, xxii. 3), as well as for the influence which his mind might have exercised over that of the 'apostle of the Gentiles,' see PAUL.

When Gamaliel died (about 17 years before the destruction of the Temple), 'the glory of the law' was said to have departed, and with him 'died the reverence before the law and the purity of *the abstinence*' (Pharisaism), (Sota, 49). His memory has always been held in highest honor. The story of his conversion to Christianity is devoid of any historical foundation, as is the legend also of the transmission of his bones to Pisa: nevertheless, Gamaliel has been placed on the list of Christian Saints, and his day is celebrated Aug. 3.

Gamaliel's grandson, named Gamaliel of Jabneh (d. abt. 115), is ranked by the Talmudists with his grandfather as one of the seven great rabbans.

GAMASEA, n. *ga-mā′sē-a* [mod. L. *gamasus*]: the beetle-mites or spider mites, a tribe of arachnida (spiders), order *Acarina*. They are destitute of eyes, and their legs have two claws and a disk. They are parasitic on insects, birds, and other animals and on some plants. One species infests bird cages, often doing great injury to the bird. The species found on poultry will live for a time on the human skin and prcduces intense irritation and itching.

GAMASHES, n. plu. *găm-ăsh′ĭz* [F. *gamaches*, spatterdashes], also GAMBA′DOES, n. plu. *-bā′dōz* [It. *gamba*, the leg, the shank]: a kind of leggings.

GAMB, *găm:* heraldic corruption of the French *jambe*, the leg: see JAMBE.

GAM′BA: see VIOLA DI GAMBA.

GAMBADOES: see under GAMASHES.

GAMBETTA, *găm-bĕt′â*, F. *gŏng-bĕh-tâ′*, LEON: 1838, Apr. 3—1882, Dec. 31; b. Cahors, France: lawyer and statesman. His family was of Genoese descent. He studied law; and 1859 joined the Paris bar. It was not till 1868 that his name came prominently before the public. He then acquired fame as counsel for defendants in political prosecutions. He was an able and determined enemy of the second empire, and was in consequence returned to the chamber, both at Paris and Marseilles, at the elections of 1869. 1870, May 5, he delivered a speech containing a panegyric of the republican form of government, which attracted great attention. After Sedan, he became minister of the interior, and he remained for some time in Paris after it was invested by the Germans; but being anxious to stir up the provinces, he contrived to escape from the city by a balloon. He came down at Amiens, and

went to Tours, where he was intrusted with the control of the war department. He assumed unlimited power, and made every effort to stir up the provinces in defense of Paris. He preached *guerre à outrance* against the Germans, and denounced the capitulation of Metz as an act of treason on the part of Marshal Bazaine. When a national assembly was resolved upon in 1871, Gambetta sought by a decree to give it an exclusively republican character by directing that no official of the second empire should take part in the election. The decree was cancelled at the instigation of Prince Bismarck, and Gambetta resigned office as minister. He subsequently entered the assembly as a member for Paris, became the leader of the extreme left, and to the violence of a speech which he delivered at Grenoble, was largely attributed the reaction which set in against the republican government, and the retirement of M. Thiers. After this his political action became more skillful and moderate, and to his leadership the republicans greatly owed their success in the elections of 1877, and their defeat of the attempts of the conservatives to deprive them of its results. Yet in the same year he was twice prosecuted for undue outspokenness, and once condemned to imprisonment. On the elevation of M. Grévy to the presidency of the republic 1879, Gambetta became president of the chamber of deputies. He was more and more regarded as the most influential statesman in France; in 1880–1, enthusiastic public receptions and other circumstances testified to his being the most popular man in the republic, though he lost favor with some of the extreme left party; and in 1881, Nov., he formed a cabinet. In the following Jan., however, he was defeated in his attempt to carry the *Scrutin de liste*, according to which scheme the unit of area for electoral purposes would be the department, and not as of late, the arrondissement; and he resigned. Though not in responsible office, he was still the most powerful man in the state; and his sayings and doings were equally canvassed at home and abroad. His later views were less extreme, and by the irreconcilables he was bitterly accused of *opportunism*. His death was in consequence of a pistol wound in the hand aggravating a malady from which he had long suffered.

GAMBIA, *găm′bĭ-a:* river of w. Africa, whose basin, and that of the Senegal, constitute the region known as Senegambia. It enters the Atlantic, lat. 13° 30′ n., and long 16° 34′ w., after an estimated course of fully 1,000 miles. It is 4 m. broad at its mouth, having a reach of double the width immediately inside. It is navigable for vessels of 150 tons up to Barraconda, a town on its right bank, about 400 m. from the sea.

GAMBIA: a British colony since 1888, on the banks of the G. river, as far up as Barraconda, though not continuously. The principal station, Bathurst, is on the Island of St. Mary, at the mouth of the Gambia. Other posts are Fort James and Fort George, the former also on St.

Mary's and the latter on Macarthy's Island, 190 m. from the sea. The climate is comparatively healthful, indeed the most so of any European settlement in w. Africa. The export trade, already considerable, is steadily increasing, comprising chiefly wax, hides, ivory, gold-dust, rice, palm-oil, horns, timber, and ground-nuts. Formerly a dependency of Sierra Leone, Gambia became an independent colony 1843, part of the W. African Settlements 1876, and a separate govt. 1888. Pop. about 160,000, including the protectorate.

GAMBIER, *găm'bēr*, James, Baron, English naval officer: b. New Providence, Bahamas, 1756, Oct. 13; d. near Uxbridge, England, 1833, April 19. He entered the navy, and off Ushant fought with distinction as commander of the Defence under Lord Howe in 1794. As admiral he commanded the British fleet at the bombardment of Copenhagen in 1807, and was rewarded with a peerage. At the action in Basque Roads in 1809 he refused to act on the advice of Lord Cochrane, was tried by court-martial, and acquitted. He attained the rank of admiral of the fleet in 1830.

GAMBIER, Ohio, village of Knox county, on the Cleveland, A. & C. railroad, 50 miles north of Columbus. It is noted for its educational institutions, including Kenyon Episcopal College, Kenyon Military Academy, Bexley Theological Seminary, and the Harcourt Female Seminary. Pop. 800.

GAMBIER ISLANDS, *găm'bēr:* a Polynesian group, under a French protectorate, lat. 23° 8′ s., and long, 134° 55′ w.; comprising five larger and several smaller islands, all of coral formation. With the exception of Pitcairn's Island, they alone, on the route between Chili and Tahiti, yield good water sufficient for the supply of shipping.

GAMBIR, or Gambier, n. *găm'bēr* [Malay name]: astringent extract, one of the most powerful of pure astringents; resembling Catechu (q.v.), and used for the same purposes; prepared from the leaves of the *Uncaria Gambir*, native of the E. Indies and Malay Archipelago. The genus *Uncaria* belongs to the nat. ord. *Cinchonaceæ*. The Gambir shrub is extensively cultivated in the Eastern Archipelago, great quantities of the light and brown yellow gambir being used in preparing betel for chewing. Gambir is obtained by boiling the leaves for a long time in water, and evaporating either by the heat of a fire or of the sun.

GAMBISON, or Gambeson, n. *găm'bĭ-sŏn*, or Wambeys [OF. *gamboison*]: thickly quilted tunic stuffed with wool, and worn by knights under the hauberk, as a padding for the armor. As it was sufficiently strong to resist ordinary cuts, it was sometimes worn without other armor.

GAMBIT, n. *găm'bĭt* [F. *gambit*—from It. *gambetto*, to trip up by the heels]: at the game of chess, an opening made by sacrificing a pawn gratuitously at an early stage of the game in order to gain a particular advantage thereby.

GAMBLE, v. *găm'bl* [Bav. *gampen*, to jump, to sport: Swiss, *gammel*, merry-making (see GAME and GAMBOL)]: to play at a game for money. GAM'BLING, imp.: N. the act or practice of one who gambles. GAMBLED, pp. *găm'bld*, lost by gambling. GAM'BLER, n. *-blĕr*, one who.—*Gambling* or *Gaming* is the act or practice of playing a game of hazard, or one depending partly on skill and partly on hazard or chance, with a view, more or less exclusive to a pecuniary gain. Games of this nature were forbidden by the Romans both under the Republic and the Empire (Cic. *Philip* ii. 23; *Dig.* ix. tit. 5; *Cod.* iii, tit. 43). The ground of prohibition was not the immoral tendency of such practices, but their effect in making the populace effeminate and unmanly. Horace (*Carm.* iii. 24) complains that youths of condition, instead of riding and hunting, had betaken themselves to illegal games of chance. It belonged to the ædiles to attend to the public interest by punishing violations of the gaming laws. During the saturnalia, a period of general license, these games were permitted (Martial iv. 14), and a like indulgence at other seasons was extended to old men among the Greeks and Romans (Eurip. *Med.* 67; Juv. xiv. 4). This vice has not been confined to civilized nations, either in the ancient or the modern world; Tacitus (*De Mor. Ger.* c. 2) mentions its existence among our own barbarian Teutonic forefathers, and it is known now to prevail among many half-civilized and even savage tribes. Often it is a refuge against the depressing sensations of languor and vacancy, which the want of active exertion causes in the minds of those who have no active inner life; and the classes most addicted to it in all countries are the idle, and men of mere business in their idle hours—men who have not cultivated an interest in anything but their business, and who, when that pressure is relaxed, find no other object for mental activity.

It is remarkable that in England as in Rome, the first ground on which gambling was prohibited was, not its demoralizing, but its effeminating influences on the community. The act 33 Henry VIII. c. 9 (1541) had in view the double object of 'maintaining artillery and debarring unlawful games.' By 'artillery' appears to be meant archery; and the act, reciting two others in the same reign, contained the preamble, that the skill of the people in this martial art 'is sore decayed, and daily is like to be more and more diminished.' The cause of this degeneracy was stated to have been the practice among the people of 'many and sundry new and crafty games,' which not only diverted popular attention from the more manly and patriotic art of shooting with the bow, but gave rise to murders, robberies, and other felonies. The act then contained anxious provisions now repealed for the revival of the art of shooting with yew bows, and other particulars. On that act followed 16 Charles II. c. 7, and 9 Anne, c. 14, the latter of which declared that all bonds, or other securities given for money won at play, or money lent at the time to

play with, should be utterly void, and all mortgages or encumbrances of lands made on the same consideration, should be made over to the use of the mortgager. The act of 1845 repealed obsolete provisions, and re-enacted the prohibitions against card-playing and other games; and was followed by acts in 1853,4, suppressing betting-houses, and gaming-houses. By 8 and Vict. c. 109, the common law of England was altered, and wagers which, with some exceptions had hitherto been considered legal contracts, were declared no longer eligible in a court of law. This prohibition does not affect contributing to prizes for lawful games. The act also facilitates against common gaming-houses by enacting that where other evidence is lacking, it shall be sufficient to prove that the house or other place is kept or used for playing at any unlawful game, and that a bank is there kept by one or more of the players exclusively of the others: or that the chances of any game played therein are not alike favorable to all the players, including among the players the manager or managers of the bank. Later statutes put heavy penalties on those who obstructed the police by putting chains or bolts against the doors of gaming-houses or by otherwise delaying the entry into such houses; and any apparatus or arrangement for giving alarm to the persons inside, was declared to be evidence that the house was a gaming-house. The persons found inside, and giving a false name or address, were made liable to a penalty of £50, and the owner or keeper of the house to a penalty of £500. The frequenters of the house are liable to be examined, and if making true and faithful discovery, are freed from all punishment. The 'Betting-houses' Act. 16 and 17 Vict. c. 119, was passed to put down all betting-houses where money is received as or for the consideration for any undertaking to pay money in the event of any horse-race or other race, fight, game, sport, or exercise, are declared gaming-houses within the statute. But nothing in the act extends to a person holding stakes to be paid to the winner of any race or lawful sport, game or exercise. In 1872 a penalty was put on the keeper of any house for the sale of liquors allowing any gaming for money or money's worth on the premises. These various enactments do not interfere with gaming in private houses.

In most of the states of Germany, gaming was allowed, and the extent to which it was practiced at the German watering-places was well known. The princes of the petty states often derived a large portion of their revenue from the tenants of their gaming establishments, whose exclusive privileges they guaranteed. Since 1873 the German gaming-tables all have been closed. Monaco has now the chief public gaming-tables of Europe.

Very strict laws have been enacted in the various states of the Union against all forms of gambling, particularly against book-making on horse-races, cock-fighting and betting thereon, and lotteries; yet the first and the last are openly carried on, and the second with more or less secrecy.

Prize-fighting and betting on the results are prohibited in nearly every state, though means are frequently formed to evade the law or at least elude its officers: and except in isolated cases dog-fighting and rat-baiting, formerly the amusement and favorite method of gambling among the lowest classes, are matters of the past. All playing for money is generally prohibited, and no court will entertain a claim for money won by any species of gambling, though in some states money deposited with a stake-holder, pending a contest in some form of gambling, may be recovered by the loser prior to its being given the winner. In Ind. it is an indictable offense for persons to play at cards for money, even the smallest possible sum; but in N. Y. it is not deemed illegal to play to see which party shall pay for the use of property or implements in the game. Generally, too, it is illegal to resort to any kind of gambling to determine who shall pay for liquors, cigars, suppers, or other articles bought or to be bought. This sort of gambling, however, is widely carried on in the most public manner; and playing at poker, faro, keno, and other games of skill or chance where large sums of money and even valuable property like real-estate depend on the result, is of nightly occurrence in hundreds of private clubs and at the fashionable resorts, though in these cases the demoralizing business is conducted with more or less privacy.

GAMBOGE, *găm-bōj′* or *găm-bôj′:* a gum-resin derived from *Garcinia hanburyi*, a member of an extremely large family of the eastern tropical countries. The gamboge tree itself is a native of Siam, Cochin-China, Cambogia, from which places the drug is imported to Europe and to the United States. Other forms of Gamboge are found in India, China, and the Asiatic Islands that are rarely seen in the American market. The gum-resin is obtained by cutting or wounding the trunks of the trees causing a bright yellow juice to flow. This is collected, usually in bamboo joints and hardens naturally, or is dried over a fire, until a solid mass results, which generally takes the shape of the collecting vessel. In the drug market pipe gamboge, press gamboge, and cake gamboge are recognized. Pipe gamboge is preferred because it is usually clean. Gamboge contains a large amount of gum, 15 to 20 per cent. and 70 to 80 per cent. of a yellow resin-gambogic acid, on which its medicinal properties depend.

Gamboge has been used as a pigment for painting for centuries. It produces a beautiful yellow color. It is also employed for staining wood, and for making a gold-colored lacquer for brass. Medicinally it has been used as a purgative in China from very ancient times. Taken in doses of from two to five grains, it acts as a very active hydragogue cathartic, producing numerous watery stools, with much griping. It is principally valuable when combined with some other drug that tends to diminish the pain, and it is one of the most important ingredients in the compound cathartic pill of the United States Pharma-

copœia, which contains one quarter of a grain of the resin. Overdoses result in violent poisoning with extreme vomiting and purging, followed by fainting and death.

GAMBOL, n. *găm'bŏl* [F. *gambiller*, to wag the leg, to dance: OF. *gambade*, a gambol—from *gambe*, the leg: It. *gambata*, a kick—from *gamba*, the leg: Lang. *jhimbela*, to tumble—from *ghimba*, to jump]: a dancing or skipping about for sport or joy; a sportive prank: V. to dance and skip about in sport or joy; to frisk. GAM'BOLLING, or GAMBOLING, imp.: ADJ. sportive. GAM'BOLLED, or GAMBOLED, pp. *-bŏld.*—SYN. of 'gambol, v.': to dance; leap; tumble; frolic; skip; start.

GAMBREL, n. *găm'brĕl* [It. *gambarella*—from *gamba*, a leg]: the hind leg of a horse; a crooked stick used by butchers for suspending animals that have been slaughtered. GAMBREL ROOF, a roof that has two slopes, the lower one the steeper.

GAMBRINUS, *găm-brī'nŭs*, a mythical king of Flanders, inventor of beer, said, probably incorrectly, to have an original in Jan Primus (or Jan I.), duke of Brabant. He is represented in Germany as Saint Gambrinus, patron of drinking. His figure is familiar in German beer-cellars, often seated astride a cask, a foaming tankard in his hand.

GAMBROON, n. *găm-brôn':* a kind of twilled linen cloth for linings.

GAME, n. *gām* [AS. and Icel. *gaman*, merry-making, sport: Sw. *gamman*, joy]: wild animals pursued and killed by hunting or shooting; the birds, etc., kept in preserves for the sport of those legally entitled to it; sport or diversion of any kind; contest for amusement; a single match at play; sportive insult or mockery; a scheme or measure planned or pursued: V. to play at any sport; to gambol: ADJ. in *familiar language*, crooked, as a 'game leg'; courageous; plucky. GAMES, n. plu. *gāmz*, public athletic and other contests—especially those established in anc. times for the diversion of the people. GA'MING, imp.: N. practice or habit of gamblers. GAME'STER, n. *-stĕr*, one who is viciously addicted to play for money; a gambler. GAME-KEEPER, n. one who has the care of certain wild animals protected by law. GAME'LY, ad. *-lĭ*, in a plucky or courageous manner. GAME'SOME, a. *-sŭm*, gay; sportive. GAME'SOMELY, ad. *-lĭ*. GAME'SOMENESS, n. GAME'-COCK, a cock of a particular species bred for fighting. GAME-LAWS, laws by which persons are punished if convicted of killing certain wild animals, of trespassing in the pursuit of them, or of having them in their possession without a certificate or license, or of killing or having them in possession at certain seasons contrary to law. ANCIENT GAMES: see ISTHMUS: NEMEA: OLYMPIC GAMES: PYTHIAN GAMES: AMPHITHEATRE: CIRCUS.

GAME LAWS: legislative enactments of nations and states to prohibit or regulate the killing of certain wild

animals, birds, and fishes deemed useful, chiefly as food for man.

GAME LAWS IN GREAT BRITAIN: in Britain certain wild animals are selected by what are called the game-laws from all other animals, and protected, for the exclusive benefit of those on whose lands they are found. In ancient times English kings distinguished themselves by the severity of the forest laws; but the crown has now little to do with the game, except where certain ancient forests, parks, chases, and free warrens are to be found: these continue to this day privileged places in many respects. There are 69 forests in England alone. See FOREST LAWS.

For England, Blackstone laid down the doctrine, that at common law the sole right of hunting and killing game belongs to the crown, and that the subject can claim this right only by tracing title to the crown. This doctrine has been clearly shown erroneous. At common law the owner of the soil, or, if he has granted a lease without reserving the right, then the lessee or occupier, has the right to kill and catch every wild animal that comes on his land. But the game-laws have made it necessary that the owner, or other person having the legal right, shall take out a game-license; and there is a certain season, called the close season, during which it is unlawful for every person to catch or kill game. Game is defined to include the following animals only—viz., hares, pheasants, partridges, grouse, heath-game, moor-game, black-game, and bustards. The close season applies only to the winged game, so that hares can be lawfully killed all the year round. But no game may be killed on Sundays or Christmas-day. Though the above animals alone are game, the game acts protect from pursuit by illegal trespass certain other animals—viz., woodcocks, snipes, quails, landrails, and conies. Also the eggs of game are protected. Trespasses in the night-time, in pursuit of game, are punished more severely than those in the daytime; and when there are several persons acting together, exceeding five, the penalties are increased; still more when the poachers are armed with dangerous weapons, and use violence. As between landlord and tenant, the general rule in leases granted after 1831 (modified, as to hares only, by the Act of 1880) is that, if there is no provision to the contrary in the lease, the tenant has the exclusive right to kill the game; hence, the landlord, in order to preserve the right, must introduce an express clause for entry. When that is done, the tenant may be punished like other persons for poaching. Formerly, it was attempted to protect lands against poachers by setting spring-guns and man-traps, and the English courts were inclined to hold this to be legal. But in 1861 a statute was passed forbidding this. In order to discountenance poaching, game is declared to be not a legal article of sale except by licensed game-dealers. Licenses are required also to kill game; also to kill deer, woodcocks, snipes, quails, landrails, and rabbits. Exceptions, how-

ever, exist, as regards killing deer and rabbits, by the owner or occupier on his inclosed ground; also as to hunting deer with hounds, coursing hares, and taking woodcock with nets and springes; and as to attendants or friends going out with licensed sportsmen. There are a few other exceptions. For each dog or gun an excise license is required.

The policy of the game-laws has often been debated. They are represented, on one hand, as too stringent, badly administered by interested justices, and opposed to the moral sentiments of the less affluent classes, who persist in treating such offenses as venial, if not praiseworthy. On the other hand, owners of land say that they are entitled to protection against trespassers.

The former presumptions of law between landlord and tenant with reference to hares have been altered for the United Kingdom by the Ground Game Act 1880, 43 and 44 Vict. c 47. This act confers on every occupier of land the right at lawful times to kill and take ground game (i.e., hares and rabbits) on the land concurrently with any other person entitled to do so. The occupier may authorize in writing the members of his family, his servants on the farm, and one other person hired for the purpose, to kill the game. Only the occupier and one other person, however, may use firearms. In the case of moorlands and uninclosed lands, except where they lie in patches of less than 25 acres among arable land, the right is to be used only between the 11th of December and 31st of March. The right is inseparable from occupation, and remains with an occupier who, having full right to the game, lets it to another person. The occupier does not require a game-license, but if he use firearms, it must be between the end of the first hour after sunset and the beginning of the last hour before sunrise. Poison is prohibited, and also spring-traps, except in rabbit holes. The act does not interfere with existing contracts of tenancy, but is being widely adopted by voluntary arrangement. Unlike those in England and on the continent of Europe generally, where the chief consideration is the preservation of game of all kinds for the personal pleasure or sport of the owner or lessee of hunting and fishing grounds, the game laws of the United States are designed more particularly to prevent the extermination of popular species by protecting them during the propagating season. In nearly every state song and insectiverous birds are protected by law in all seasons of the year, and in all states wholesale slaughter is prohibited. In general, wild creatures, fish, flesh, and fowl are denominated game, and can be shot, trapped, hooked, speared, or otherwise killed by any one in seasons of the year specified in state and county laws, provided there is no trespass on private domains. In every state and territory where game of any kind abounds in sufficient quantity to become an object of sport, the seasons in which each kind may be hunted are prescribed in state, county, and local laws. These seasons are in no wise uniform. In some states

the hunting or fishing season for a given kind of game differs in each county. The laws are very ample and strict, but they are ignored in sparsely settled sections and evaded where possible in others. This condition has prompted true sportsmen in various parts of the country to organize associations, which lease or buy tracts of land or water, stock them with game, and carefully protect them during the propagating season. In these cases hunting and fishing are practiced only in the 'open seasons,' and then to an extent that will not lead to extinction. The national game law, known as the Lacey Law, passed by Congress in 1900, gave to the Department of Agriculture certain powers, by which among other provisions no importation of wild animals, birds, or fishes could be made without a permit from the secretary of agriculture. In 1902 a Federal law was passed amending the tariff act so as to permit the importation of eggs of game birds for propagation.

Thirty-two States now have Audubon societies, which are formed primarily for the protection of birds other than game. The committee of the American Orinithologists' Union on the protection of birds extended its work along the coast, and now maintains supervision of the breeding colonies of sea birds on the Atlantic coast from Eastport, Me., to Chesapeake Bay, as well as at some points in Florida.

Practically all the State game laws passed by the various State legislatures prohibit the export of game, hunting, or fishing for commercial purposes, and hunting big game with dogs. In a few States the netting of minnows for bait is also prohibited. The kiling of song birds is forbidden in most of the States, but this law does not apply to the hawk, owl, crow, blackbird, and English sparrow. Hunting and fishing in the national Yellowstone Park is prohibited.

GAME PRESERVES, or GAME PARKS, are large reservations of land, usually including mountain and forest, set aside by the government or individuals for the propagation and preservation of game. Game preserves have been well known in Great Britain and on the Continent for upward of five centuries. Henry VIII. established a royal deer park near Hampton Palace in 1526, and the Duke of Sutherland at the present day owns the largest game preserve in the world. Game preservation in the United States first attracted attention just prior to the Civil War and later when the rapidly increasing settlement of the States threatened the extinction of all kinds of wild game.

The United States government took up the question of game preservation almost as soon as the individual, and the establishment of the Yellowstone National Park in the Rocky Mountains, and the Yosemite National Park in California had as much to do with the protection of big game as in the preservation of forests. In these two reservations the government ranges have endeavored

to preserve and protect such large game as the buffalo, elk, and moose. In 1902, President Roosevelt, himself a hunter of big game, declared no less than 12 new national forest reserves, which while largely important to forestry, will greatly assist in the protection of big game. These new reserves have a total area of 14,276,476 acres, which makes a grand total of government parks and reservations of 60,162,525 acres. The new reserves added in 1902 were as follows:

	Acres
The San Isabel, Colorado	77,980
The San Rita, Arizona	337,300
The Niobrara, Nebraska	123,779
The Dismal River, Nebraska	85,123
The Santa Catalina, Arizona	155,520
The Mount Graham, Arizona	118,600
The Lincoln, New Mexico	500,000
The Chiricahua, Arizona	169,600
The Madison, Montana	736,000
The Little Belt Mountains, Montana	501,000
Alexander Archipelago, Alaska	4,506,240
The Absaroka, Montana	1,311,600

Of private game parks in the United States, the first of record was that of Judge J. D. Caton, of Ottawa, Ill., the author of *Deer and Antelope in the United States.* This he established in 1860, for sport and study, bringing together on his large estate many varieties of game animals native to America. In 1889, Austin Corbin enclosed the largest preserve in the United States, and next to that of the Duke of Sutherland, the largest in the world. It is known as Blue Mountain Forest and is situated near Newport, N. H. It contains over 36,000 acres, and is surrounded by a wire fence, 8 feet high, forming an oblong tract 12 by 5 miles, and which is crossed by a mountain range, the peaks of which are 3,000 feet high. Here are miles of wooded slopes, dense forests, and broad meadows, giving food and shelter to all kinds of game animals, from the buffalo, elk, and moose to the smaller species. The experiment has been most successful, nearly all of the animals thriving and increasing rapidly in numbers. In 1870, F. S. Giles laid out the Grove Park reservation, containing 17,000 acres, and this experiment was followed by Dr. W. Seward Webb with a preserve of 9,000 acres at Nehasane, N. Y., in the Adirondacks, and another preserve at Shelburne, Vt. The Litchfield Park at Tupper Lake, N. Y., in the Adirondacks, was established in 1893, with 9,000 acres, and in 1900 hundreds of herds of large game were roaming the mountain forests within this tract. In the same region the Adirondack Timber Company has a park of over 30,000 acres, well stocked with animals. George W. Vanderbilt at his Carolina estate of Biltmore, has 80,000 acres, 6,000 acres of which are enclosed and well stocked with game. A small army of men are engaged here as keepers. In many of the smaller parks particular attention has been paid to game birds, such as the English pheasant, prairie chicken, and wild turkey. A lover of birds imported large numbers of Japanese pheasants for his preserve in Oregon in 1893,

the experiment proving a great success. E. C. Benedict, of Greenwich, Conn., has established extensive fish preserves in Long Island Sound, which are the largest and most successful of their kind in this country. Near Plattsburg, N. Y., Paul Smith owns an immense preserve around St. Regis Lake, of 40,000 acres. Large numbers of elk were brought here from the West in 1903. William C. Whitney of New York was active in stocking the Adirondack region with big game, and in conjunction with Dr. F. E. Kendall, of Saranac Lake, restocked the forests with elk and deer. At Delaware Water Gap, Pa., on the New Jersey side of the Delaware River, Mr. C. C. Worthington, of New York, established in 1902 an extensive deer park, which is one of the most successful in that section of the country.

In Canada there are several large game preserves, prominent among which is the Caughnawaga reservation on the Maquacippi River. The Roberval Club, which has a membership of 300, including both American and Canadian, owns a big game preserve containing 500 square miles, located in the Laurentian Mountains. Henri Menier occupies as a game park the whole of Anticosti Island, in the Gulf of St. Lawrence.

GAMIN, n. *gă-măng'* [F. *gamin:* comp. Gael. *gaman,* to run wildly about]: in *France,* a rude boy; an idle street boy; a blackguard.

GAMMA, *găm'ma,* or GAM'ME, or GAM'MUT: system of musical notation invented by Guïdo; named from the Greek letter *Gamma,* which he took as the name for his first note. This name, with Guido's solmization, fell into disuse. In modern music the term is applied to the scale or compass of wind-instruments. See GAMUT.

GAMMADION, n. *găm-mā'dĭ-on:* in *eccles.* and *chh. hist.,* cruciform ornament embroidered on or woven into ecclesiastical vestments; named from being composed of four gammas placed back to back, forming a voided Greek cross.

GAMMARUS, *găm'ma-rŭs:* genus of *Crustacea* of the section *Edriophthalma* (q.v.), and order *Amphipoda,* of which one species, *G. Pulex,* is extremely common in springs and rivulets in some countries, particularly where decaying vegetable matter has accumulated. It generally keeps near the bottom; swims on its side, with a kind of jerking motion, and feeds on dead fishes or any other animal matter. It is sometimes called the Freshwater Shrimp.

GAMMA'TION. See GAMMADION.

GAMMER, n. *găm'mėr* [AS. *gemeder:* contr. of *godmother* or *grandmother:* F. *grandmère,* grandmother]: a word formerly used in addressing old women.

GAMMON, n. *găm'mŭn* [It. *gambone,* any great leg—from *gamba,* a leg: F. *jambon,* a ham—from *jambe,* a leg: OF. *gambon*—from *gambe,* a leg]: a smoked or cured ham;

the hinder and thick portion of a flitch of bacon having part of the leg.

GAMMON, int. *găm′mŭn* [Dan. *gammen*, sport: Fris. *gammen*, interjection of contempt]: a familiar exclamation, signifying 'nonsense, you are joking': N. an imposition or hoax: V. to impose on by hoaxing or humbugging; to defeat at the game backgammon. GAM′MONING, imp. GAM′MONED, pp. *-mŭnd*. BACKGAMMON, n. a game played with men, and a box and dice.

GAMOPETALOUS, a. *găm′ō pĕt′ă-lŭs* [Gr. *gamos*, marriage; *pĕtălon*, a leaf]: in *bot.*, having a corolla formed by the union or grafting together of several petals so as to form a tube; monopetalous. GAM OSEP′ALOUS, a. *-sĕp′ă-lŭs* [*sepalon*, an adapted word from Gr. *petalon*, for a sepal]: having a calyx formed by the union of several sepals; monosepalous.

GAMOPHYLLOUS, a. *găm′ō-fĭl′lŭs* [Gr. *gamos*, marriage; *phullon*, a leaf]: in *bot.*, having leaves united by their edges; applied to a single verticil of bracts with their edges, when they come into contact with each other, united so as to appear like a *gamosepalous* calyx, in contradistinction to *polyphyllous* bracts.

GAMRUN. See GOMBROON.

GAMUT, n. *găm′ŭt* [F. *gamme*, the musical scale—from *game* or *gamme*, a chime of bells, and *ut*, used formerly to mark or designate the first note of the scale]: the lines and spaces on which musical notes are written; the musical scale: see MUSIC: SCALE, MUSICAL. Guido of Arezzo, in the 11th c., marked the last of the series of notes in his musical notation with a *g* or the Greek letter γ (*gamma*), which had a prominent place at front of the whole scale, and whose name was thence used for the whole—often in a French form *gamme*. *Gamut* is compounded of this word and *ut*, the beginning of a Latin hymn used in singing the scale. See SOLFEGGIO.

GAND. See GHENT.

GANDER, n. *găn′dėr* [AS. *gandra*]: the male of the goose.

GANDERSHEIM, *gân′dėrs-hīm*, ABBEY OF: one of the most famous structures in Germany, in the town of Gandersheim in the duchy of Brunswick on the Gande river; founded A.D. 856 by Duke Ludolf of Saxony and his wife Oda. On its completion they removed the nuns, whom they had established some time previously, to it, and appointed their daughter, Hathumeda, its first abbess. It afterward received a number of extraordinary privileges which soon made it wellknown throughout Europe. King Louis III. decreed that the office of abbess should be filled from the ducal family as long as it had a competent member; Otto III. presented it a market, mint, and the right of collecting toll; Pope Innocent III. separated it from the jurisdiction of any bp. or abp., and secular laws made it subordinate only to the empire, and invested the abbess with the right of voting in the diet. The estate

grew to a great extent and in time the abbess had a court so powerful that neither the elector of Hanover nor the king of Prussia dared disregard its summons. The last Rom. Cath. abbess, Magdalena, died 1589, 21 years after the introduction of Protestanism, and from that year till 1802, when Gandersheim became a part of Brunswick, Protestant abbesses were appointed and sustained in the exercise of all the early privileges.

GANDO, *găn'dō:* a kingdom of Súdan, on both sides of the Niger; bounded n.w. by Songhay, e. by Sókoto. The Benue joins the Niger near its s. border. The country is fertile, and the vegetation in many places luxuriant. The principal productions are the yam, the date, and the banana. The inhabitants are of the Fulah race (see FULAHS), and mostly Mohammedans.

GANDO, the cap. of the kingdom, lies in a narrow valley, surrounded and commanded by hilly chains. It is a pleasant and animated town, and the inhabitants are industrious, manufacturing much cotton cloth.—Rabba and Egga, on the Niger, are the chief commercial towns of the country.

GANDOL'FO. See CASTEL-GANDOLFO.

GANG, n. *găng* [AS. *gang,* a journey, a step: Icel. *gangr,* a going: Ger. *gang,* a walk, a gallery (see Go)]: a number going in company, usually of workmen, but frequently used in a bad sense; a crew; a band. GANG'ER, n. *-ėr,* the foreman of a gang of laborers on a railway. GANG, or GANGUE, n. *găng,* German term for a vein or lode; the matrix or portion of rock in which a metallic ore is embedded; quartz is the most common gang, but calc-spar also is very frequent, sulphate of barytes and fluor-spar are not rare. GANG'PLANK, a board or plank with strips of wood nailed across it for the convenience of walking into a boat, etc., without slipping. GANG-DAYS, days of perambulation, or of walking through the bounds of a parish, in Rogation week: see ROGATION. GANG'-WAY, entrance to a ship, consisting of cleats nailed on the ship's side-planking for steps, with a rope to aid in climbing; but usually, in harbor, a portable flight of steps called an accommodation-ladder is placed over the vessel's side: temporary road or passage into or out of a ship; the passage from one part of a ship to another; any temporary access formed of planks to a building: narrow passage of any kind. GANG-WEEK, the week in which the gang days occur. AGRICULTURAL GANGS: see GANGS, AGRICULTURAL (below).—SYN. of 'gang': company; society; association; combination.

GANGA, *găng'ga,* or SAND-GROUSE (*Pterocles*): genus of gallinaceous birds, of the family *Tetraonidæ,* closely allied to grouse and ptarmigan, but distinguished by a pointed tail. The toes are not feathered. The species are natives chiefly of the warm parts of Asia and Africa, and are most abundant in arid sandy plains. Two species, the Banded Sand-grouse (*P. arenarius*) and the Pin-tailed Sand-grouse

(*P. setarius*), are found in s. Europe. The latter species is abundant on the arid plains of Persia. In Europe, it is found as far n. as the south of France, chiefly in the sterile *Landes*. It is always seen in the markets of Madrid. The Banded Sand-grouse is abundant in s. Russia. The African species are often seen in large flocks near their drinking-places.

GANGES, *găn'jēz* or *gân'jēz:* river prominent alike in the religion and in the geography of the East, divides, at least toward the sea, India in its largest sense into the two grand divisions of *Hither* and *Farther*. Its entire length is more than 1,500 m. Its general direction during the first half of its course is s.e.; it then flows e. through the plain of Bengal, as far as Rajmuhal, about 400 m., after which it again proceeds s.e. and enters the sea through a multitudinous delta. For detailed description, the stream, which shows great variety of phases in its different parts, may be considered in five sections: (1) from its springs to Gangotri; (2) Gangotri to Hurdwar; (3) Hurdwar to Allahabad; (4) Allahabad to Seebgunge, or the head of the Delta; (5) Seebgunge, or the head of the Delta, to the Bay of Bengal.

From its Springs to Gangotri.—The Bhageerettee, Bhagirathi, or Bhaghireti, generally regarded as the true Ganges, rises in Gurhwal, near lat. 30° 54′ n., and long. 79° 7′ e., from a snow-field imbedded between three mountains about 22,000 ft. in height. The actual spot from which it is seen to issue is 13,800 ft. above the sea. After a course of 10 m. throughout which the torrent is almost inaccessible, it reaches the temple of Gangotri, the first work of man on its banks, at an elevation of 10,300 ft. having descended about 350 ft. in a mile.—*From Gangotri to Hurdwar.*—After seven m. the stream is joined on the right by the Jahnuvi, considerably larger than itself lat. 31° 2′ n. and long. 78° 54′ e.; and the united waters, 13m. further down burst through the Himalaya proper, lat. 30° 59′ n. and long. 78° 45′ e. Still 90 m. lower, it receives the Aluknanda with a volume one-half greater than its own, and here first it receives the name Ganges. A distance of 47 m. more carries the still rapid current down to Hurdwar, on the verge of the great plain of Hindustan, at an elevation of 1,024 ft. showing a descent of 9,276 ft. in 157 m. or of nearly 60 ft. in a mile.—*From Hurdwar to Allahabad.*—This portion of the river, 488 m. averaging a fall of 22 inches in a mile, is beset almost throughout by shoals and rapids. It is navigable, however, for river-craft the whole way to Hurdwar, for passenger-steamers to within 100 m. of the mountains, and for loaded barges up to Cawnpore, 140 m. above Allahabad, which city stands at the confluence of the Ganges and the Jumna.—*From Allahabad to Seebgunge, or the head of the Delta.*—This, the longest of the five divisions of the stream, is 563 m. in length, and has a fall of about five inches in a mile. Notwithstanding many shoals,

it is navigable throughout, even in the driest season of the year, for vessels drawing 18 inches. About 270 m. below Allahabad, the Ganges is joined on the left by the Ghogra, having previously received the Gumti on the same side, and the Tons and the Kurumnassa on the right. About halfway the Tons and the Kurumnassa on the right. About halfway between Allahabad and the Ghogra is the city of Benares. Between the Ghogsa and Seebgunge, the principal affluents are the Sone on the right, and the Gunduk and the Coosy or Sun Kosi, on the left. Along this entire section, the Ganges varies largely both in breadth and in depth, according to the season of the year. —*From Seebgunge, or the head of the Delta, to the Bay of Bengal.*—Here the descent, along a line of 283 m. averages about three inches in a mile. Hitherto swollen by its feeders, the Ganges here begins to send off branches, parting at Seebgunge with the Bhagrutti, and next, 70 m. further down, with the Jellinghi, at the town of the same name, which two, after separate courses of about 120 m. each, unite to form the Hoogly of Calcutta. Below the point of departure of the Jellinghi, the Ganges throws out similar offsets, the Marabhanga, the Gorae, the Chundni, and the Kirtynassa. Meanwhile, this waste toward the right is in a great measure compensated by affluents on the left, especially by various channels of the Brahmaputra—the two great net-works of waters intertwining themselves together in a manner too complex for delineation, and at last indenting a long line of coast with at least 20 estuaries. The mouth of the Hoogly, the most available of all the branches of the Ganges, as the means of communicating with the outside world, is in lat. 21° 40′ n., and long. 88° e. By it the largest ships reach Diamond Harbor, while vessels of considerable burden ascend to Chandernagore. Between the Hoogly and the Ganges, above the Delta, there are two routes. When the water is high, the Bhagrutti and the Jellinghi afford the requisite facilities; but in the dry season, the intercourse is maintained by the Sunderbund or Sunderbans Passage, a circuitous course to the n. e. which opens into the Chundni.

As a whole, however, the Ganges is incapable of being definitely described. It varies not merely from season to season, but also from year to year. From year to year it exchanges old passages for new ones, particularly in the alluvial basin of its lower sections. Even as far up as Futtehpore, immediately above Allahabad, 846 m. from the sea, this characteristic is remarkably exemplified. The river has in this part a bed of the average width of four m. within the limits of which it changes its course annually, in the lapse of four or five years shifting from one limit to the other. Between season and season, again, the fluctuations are still more conspicuous: for instance, at Benares, 710 m. from the sea, the stream ranges, according to the time of year, from 1,400 ft. to 3,000 ft. in breadth, and from 35 ft. to 78 ft. in depth. Lower down, the vicissi-

tudes, without being more striking in themselves, produce more striking results. About the close of July, a considerable proportion of the Delta presents an inundation more than 100 m. in diameter, with nothing visible but villages and trees, and craft of every sort. To prevent or mitigate this evil, expensive dams have been constructed having collectively a length of above 1,000 m. The influence of the tides extends, at the dry season, 240 m. from the sea. The minimum quantity of water delivered per second has been estimated at 36,330 cubic ft. and the maximum at 494,208 cubic feet. Like all rivers that overflow their banks, the Ganges holds in suspension a large admixture of mud and sand—intrusive elements eminently unfavorable to stream-navigation, as causing quick wear and decay of the cocks and valves of the engines. It has been computed that the Ganges delivers, on an average, annually into the sea 534,600,000 tons of solid matter.

Among the rivers which at the *classical* and the *Purânic* period of India were held in peculiar sanctity by the nation, the Ganges—or, as it is called, the *Gangâ* (feminine)—undoubtedly occupied the foremost rank. In the vedic poetry, it is seldom mentioned; and whenever its name occurs, whether in the hymns of the *Rig-Veda* or the ritual text of the *Yajur-Veda*, no legendary fact or mythical narrative is connected with it. Nor does the law-book of Manu justify the conclusion that its author was acquainted with any of the myths which connect this river in the epic poems and in the Purânas with the Pantheon of India. See INDIA, and various titles there referred to. The earliest, and by far the most poetical legend of the Ganges, occurs in that masterpiece of Sanskrit poetry, the *Râmâyana*. The substance of this account likewise is repeated by the *Mahâbhârata* and several of the Purânas, though they differ in the names of the streams formed by the Gangâ in her descent, some (for instance, the *Vishu-* and *Vâyu-Purâna*) restricting their number from seven to four, called by the *Vishnu-Purâna* Sîtâ, Alakanandâ, Chakshu, and Bhadrâ. A further deviation from the original myth was caused by sectarian influence; for, whereas in the *Râmâyana*, the Gangâ springs from the Himavat (Himalaya), whose daughter, therefore, she is, and the god Siva plays the most prominent part in her descent to earth, the *Vishnu-Purâna* assigns her source to the nail of the great toe of Vishnu's left foot, and allows Siva to receive one of her branches on his head. The Sîtâ, Alakanandâ, Chakshu, and Bhadrâ, are four branches of but one river, divided according to the regions toward which it proceeds. The branch known as Alakanandâ was borne affectionately by Siva, upon his head, for more than a hundred years, and was the river which raised to heaven the sinful sons of Sagara by washing their ashes. The offenses of any man who bathes in this river are immediately expiated, and unprecedented virtue is engendered. Its waters, offered by sons to their

ancestors in faith for three years, yield to the latter rarely attainable gratification. Men of the twice-born orders, who offer sacrifice in this river to the lord of sacrifice, Pumshottama, obtain whatever they desire, either here or in heaven. Saints who are purified from all evil by bathing in its waters, and whose minds are intent on Kesava (Vishnu), acquire thereby final liberation. This sacred stream, heard of, desired, seen, touched, bathed in, or hymned day by day, sanctifies all beings; and those who even at a distance of a hundred leagues, exclaim 'Ganga, Ganga', atone for the sins committed during three previous lives. How far the belief expressed in the latter passage was carried at a period probably succeeding that of the composition of the *Vishnu-Purâna* may be seen from a legend in the *Kriyâyogasâra*, the sixth division of the *Padma-Purâna*. This Purâna relates that a king, Manobhadra, having grown old and weak, resolved upon dividing his kingdom between his two sons. He therefore convoked a council of his ministers, when of a sudden, a vulture and his mate flew into the hall, to the surprise of the whole assembly. Questioned about the purpose of their visit, they replied that, having witnessed the evil luck of the two princes in a former birth, they now came to rejoice in their happiness. The king's curiosity having been roused, the male vulture then said, that in the age called Dwapara, the two princes had been two men of low caste, called Gara and Sangara, and when dead, were brought before Yama, the judge of the dead, who sentenced them to be thrown into a fearful hell. Their lives had indeed been faultless; no sin had been committed by them, but whenever they gave alms, they did not offer them to a Brâhmana, and thus robbing the latter of the property which otherwise would have come to him, they became candidates for hell. He, the vulture, had come to the same place, because, when being a noble Brâhmana, Sarvasa, he slighted his parents. Now the period of their sentence having expired, he was reborn as a member of the vulture tribe, which is living on the flesh of the dead, whereas the king's two sons became two locusts. Once, however, a hurricane arose, and threw the locusts into the Ganges; there they died; but having found their death in the water of the river which destroys all guilt, the servants of Vishnu came with heavenly chariots to conduct them to his town. Having stayed there till to the end of the third Kalpa, they were bidden by Brahman to enjoy themselves in the paradise of Indra; and after a certain time they were reborn in the family of Manobhadra, ultimately to rule his country.—All the hymns addressed to the Ganges—and a remarkable one occurs in the same division of the *Padma-Purâna*—partly allude to the legends mentioned before, or to other feats of purification worked by the sacred water of this river. Its efficacy is deemed greatest at the spot where the Ganges joins the Yamunâ, or Jumna, at Allahabad, where in reality the waters of the three sacred rivers meet.

It is the imperative duty of the Hindus to bath in the Ganges, or at least to wash themselves with its waters, and to distribute alms on certain days. Whoever dies on its banks, and drinks of its waters before his death, is thought to be exempted from the necessity of returning into this world and beginning a new life. Such as live too far from the river to admit of this always preserve some of the precious water in a copper vessel that it may be given them in the hour of death. This water is therefore a desirable article of commerce in India.

GAN'GES CANAL: modern imitation, in some measure of the more ancient works of the kind on the Jumna (q.v.). has two main objects—the irrigating of the Doab, and the avoiding of the difficulties in the navigation of the river above Cawnpore. Extending, on the right of the Ganges, from Hurdwar to Cawnpore, it measures, including its branches, 810 m.—350 for the trunk and 460 for the offsets. In its course, it crosses the Solani on perhaps the most magnificent aqueduct in the world. This noble work, erected at a cost of $1,500,000, consists of 15 arches, each having a span of 50 ft.; while the piers, sunk 20 ft. below the bed of the stream, are protected on every side against the force of the current by ingeniously compacted masses of piles and stones.

GANGETIC, a. *găn-jĕt'ĭk:* pertaining to the great river *Ganges*, or connected with it; designating a family of languages.

GANGI, *gân'jē:* town of Sicily, province of Palermo, 53 m. s.e. of Palermo. It occupies the summit and slopes of a steep and lofty hill. The old town was destroyed 1299 by Frederick II. The painter Giuseppe Salerno was born here, and in one of the churches is a much admired painting, the *Last Judgment*, from his hand. Pop. 12,000.

GANGLION, n. *găng'glĭ-ŏn*, GAN-GLIONS, or GAN'GLIA, n. plu. *-glĭ-ă* [Gr. *gangglĭŏn*, a little tumor under the skin near the sinews]: in *anat.*, an enlargement in the course of a nerve; a tumor in the sheath of a tendon: see BRAIN: NERVOUS SYSTEM. GAN'GLIATED, a. *-ā-tĕd*, having ganglions intertwined GAN'GLION'IC, a. *-ŏn'ĭk*, relating to ganglia; applied to collections of nucleated nerve-cells which are centres of nervous power to the fibres connected with them. GAN'GLIONEU'RA, n. *-ō-nū'ră* [Gr. *neuron*, a nerve]: a name applied to the molluscous and articulate divisions of the animal kingdom, which are characterized by a ganglionic nervous system.

GANGOTRI, *gân-gō'trē:* temple erected on the highest accessible spot on the Ganges (q.v.), about 10,000 ft. above the sea; on the right bank of the river, here called the Bhagirathi, about ten m. from its source. Immediately in front, the stream expands into a small lake, which is subdivided into pools, taking their names respectively from Brahma, Vishnu, and other gods of the native mythology.

Though the water is specially sacred, and ablution peculiarly efficacious, yet, from various causes, the pilgrims are not numerous. Beside the length and ruggedness of the journey, and the difficulty of procuring subsistence by the way, there is no accommodation for visitors, the only dwelling-house in the locality being occupied by the officiating Brahmans. Superstition, however, has found a remedy in the exportation of flasks of the holy element, sealed by the attendant priests.

GANGRA, *găn'gra,* COUNCIL OF: at Gangra, cap. of Paphlagonia, abt. A.D. 379, to condemn the asceticism of Eustathius, Bp. of Sebaste, who had been teaching the unlawfulness of eating certain meats, separating married couples, and directing those to communicate at home who were dissatisfied with the public offices of the church. It is believed that Eustathius was deposed by the council, for St. Basil (died 379) made no mention of the council, and Eustathius no longer held the see of Sebaste in 380. The council published 21 canons, which anathematized those who out of spiritual pride and a false conception of purity condemned marriage and despised those who were married, and at the same time guarded the council from being supposed not to honor and admire virginity when adopted with humility and charity.

GANGRENE, n. *găng'grēn* [F. *gangrène*—from L. *gangroena*—Gr. *ganggraina,* a gangrene—*grainō,* I eat or gnaw]: loss of vitality in a part of the living body, whether external or internal, the part becoming often, in the first instance, more or less red, hot, and painful, then livid, and finally dark and discolored, black or olive-green, according to circumstances, and putrescent; after which a separation takes place gradually between the living and dead parts, and if the patient survive, the disorganized and lifeless tissue is thrown off, and the part heals by the formation of a cicatrix, or scar, indicating the loss of substance. Gangrene is an occasional consequence of inflammation, but is often also determined by injury, by frost bite, by the action of poisons (e.g. ergot) on the system, and frequently by obstruction or occlusion of the arteries of a part. This last is especially the case in the form called senile gangrene. There are two distinct forms of gangrene, called from the condition of the affected parts, dry and moist gangrene. Dry gangrene is a sort of a mummification, the dead parts growing more and more dark in color; this is usually the form seen when the blood-supply is shut off by disease of the main artery feeding the part. In moist gangrene access of blood to the part is not prevented, but the veins leading from the region are obstructed so that the blood stagnates; this form often results from injury, malnutrition, or frost-bite, and occurs as a complication of diabetes or Bright's disease. Senile gangrene may be of either the moist or dry variety. Gangrene from ergot poisoning is almost always dry; as is that from carbolic acid poisoning. Gan-

grene is a serious and often fatal disease. It was formerly very prevalent in military and other hospitals, but aseptic surgery has made this a thing of the past. Spreading gangrene is due to infection from a specific germ, the bacillus of malignant œdema. The treatment of gangrene is usually a matter of amputation or of cutting well beyond the affected part. Careful antiseptic dressing is imperative. GANGRENE, v. to mortify or become mortified. GAN'GRENING, imp. GAN'GRENED, pp. *-grēnd:* ADJ. affected with gangrene. GANGRENOUS, a. *găng'grē-nŭs*, showing a tendency to gangrene; having the character of gangrene.

GANGS, AGRICULTURAL: in England, companies of women and boys and girls, brought together for labor in the fen-districts or the low and level tracts s. of the Wash, once a marsh, now one of the most fertile agricultural districts of England. The reclaimed land was cultivated by laborers mainly from the villages which are numerous on the high ground that borders it. To save expense, they consisted, as much as possible, of women, girls, and boys. They worked in gangs, and as many as 27,000 persons were so employed. An act of 1867 provided that no woman or child was to be employed in the same gang with men or boys, and that no woman or girl was to be employed in any gang under a male gangmaster, unless a woman licensed to act as superintendent was also present with the gang.

GANGUE: see GANG.

GANJAM: town in the presidency of Madras, on the left bank of the Rosikoila, immediately above its entrance into the Bay of Bengal; lat. 19° 23′ n., and long. 85° 7′ e. It was formerly cap. of the district of Ganjam, and was remarkable for its fine buildings. But in 1815, when the town was visited by deadly fevers and agues, and all the public establishments were removed to Chicacole (q.v.); the fort and cantonments gradually fell into ruin, and the place sank into decay.

GANNET, n. *găn'nĕt* [AS. *ganota*, the wild goose], (*Sula*): genus of web-footed birds, of the family *Sulidæ*, having a long, strong, conical bill, the face and throat naked, the feet with four toes, three before and one behind, all united by the web. To this genus the Booby (q.v.) belongs. Another species is the COMMON GANNET, or SOLAN GOOSE (*S. Bassana*), a bird which breeds on insular rocks in northern seas, and migrates in winter to warmer and even tropical regions. The name *Solan* or *Soland* Goose is from *Solent*, an old name of the English Channel. The entire length of the gannet is about three ft.; its general color milk-white, the crown and back of the head pale yellow, the quill feathers of the wings black. The gannet lays usually a single egg, of chalky white color; the young bird, when newly hatched, has a naked bluish-black skin, but soon becomes covered with a thick white down, so that it resembles a powder-puff, or a mass of cotton; and when the

true feathers appear, they are black, with lines and spots of dull white, so that the plumage of the young is very unlike that of the mature bird. The gannet is long-lived, and takes about four years to come to maturity. Its motions on land are very awkward; but it is a bird of very powerful wing and graceful flight. It extends its flight to great distances from the rocks which it inhabits, pursuing shoals of such fish chiefly as swim near the surface, particularly herring, pilchards, and others of the same family. The presence of a shoal of pilchards often becomes known to fishermen from the attendant gannets. When feeding the gannet always flies against the wind at an altitude of not more than about 100 ft. above the sea. When it espies a fish it instantaneously stops, and with wings *half* distended, stoops and swiftly cleaves the air. When within a yard or two of the surface, and just as it makes the plunge, the wings are clapped close to its sides: thus the bird enters the water like a bolt. The gannet is found in every continent. The young are killed by cliff-men who are lowered down the rock by a rope; they are valued for their down, flesh, and oil, which bring a profit to the person who rents the rock. On and around the Bass, gannets are seen in prodigious numbers, the air around the rock being filled with them like bees around a hive, and the rock itself whitened by them and their accumulated excrements. Their nests are formed of seaweeds, and marine grasses. The gannet, during incubation, will often allow itself to be touched with a stick without rising from the nest. Its flesh is rank and oily; but that of the young, baked, is eaten in many places, and by some is even reckoned a delicacy. The eggs are considered a decided delicacy. They are boiled 20 minutes, and eaten cold, with vinegar, salt, and pepper. The voice of the gannet is harsh, and the cries of the multitudinous birds, when disturbed at their breeding-places, are deafening. The gannet comes to its breeding-places in the beginning of April, and leaves in autumn.—A species of gannet (*S. variegata*), extremely abundant in some parts of the southern hemisphere, is said to be the chief producer of guano.

GANNISTER, or GANNISTER-BEDS, n. *găn′nĭs-tėr:* a miner's term for certain hard silicious beds at the base of the true coal-measures; a term denoting a fine hard-grained grit.

GANOCEPHALA, n. *găn′ō-sĕf′ă-lă* [Gr. *ganos*, lustre *kephălē*, the head]: a name applied to one of the orders of Reptilia, living and extinct, having reference to the sculptured and externally polished or ganoid bony plates with which the head is defended. GAN′OCEPH′ALOUS, a. *-lŭs*, pertaining to.

GANOID, a. *găn′oyd*, also GANOI′DIAN, a. *-oy′dē-ăn* [Gr. *ganos*, splendor; *eidos*, appearance]: applied to an order of fishes, living and extinct, having angular scales, composed of horny or bony plates covered with a strong shining enamel. GANOIDEI, n. plu. *găn-oy′dē-ī*, the order of ganoid

fishes; one of the four orders of fishes in the classification of Agassiz, characterized by shining scales, covered with enamel, angular, either rhomboidal or polygonal. Ganoid scales are often large, thick, and bony; they are usually in oblique rows, and united to each other by a kind of hook at the anterior angle. Recent ganoid fishes do not form a natural group, but differ in very important parts of their organization. Some of them have an osseous some a cartilaginous skeleton. Recent ganoid fishes are however, comparatively few; whereas, among fossil fishes, the ganoid type is extremely prevalent. The sturgeon is an example of a ganoid fish.

GANS, *gâns*, EDUARD, LL.D.: jurist: 1798, Mar. 22—1839, May 5; b. Berlin; of Jewish parentage. He studied at the Universities of Berlin, Göttingen, and Heidelberg, became a doctor of law and published *Scholien zum Gajus* 1820, visited France and England 1825, and was appointed prof. extraordinary in the Univ. of Berlin 1826. His vivacious style made him exceedingly popular as a lecturer, but his liberal political views were an annoyance to the govt. He published *Das Erbrecht in Weltgeshichtlicher Entwickelung*, 4 vols. (Stuttgart, 1824-35), in which he opposed the scientific features of the historical school of jurisprudence, and treated the science of law on the basis of Hegel's philosophy and edited the *Philosophie der Geschichte* in the posthumous edition of Hegel's works.

GANSEVOORT, *găn'sē-vōrt*, PETER, JR.: 1749, July 17—1812, July 2; b. Albany: soldier. He was appointed maj. in the 2d N. Y regt. 1775, July 19, and in Aug. accompanied the army that invaded Canada under Gen. Montgomery. In 1776 he was promoted lieut.col. and col., and appointed commander of Fort George; and in 1777, as commander of Fort Stanwix, he defended the post against a combined British and Indian siege of 20 days, and so prevented St. Leger's co-operation with Burgoyne. For this feat he received the thanks of congress. After the war he became brig.-gen. of N. Y. mlitia, U. S. commissioner of Indian affairs, commissioner for fortifying the frontier, military agent, and brig.gen. U. S. army.

GANTLET, n. *găn't'lĕt*, or GAUNTLET, n. *gânt'lĕt* [OF. *gantelet*, an iron glove—from OF. *gant*, a glove: It. *guanto*, a glove—from mid. L. *wantus*, a gantlet, a glove]: anciently an iron glove, part of the armor of knights and men-at-arms, introduced abt. the 13th c. The back of the hand was covered with plates jointed together to permit the hand to close. Gantlets were frequently thrown down by way of challenge, like gloves. They are frequent in heraldry, the fact of their being for the right or left hand being expressed by the words 'dexter' or 'sinister.' Gantlet is, in recent years, applied to a somewhat large thick glove with a (usually) stiff prolongation over the wrist. GAUNTLETED, a. *-lĕt-ĕd*, wearing a gantlet. TO THROW THE GANTLET, to challenge. TO TAKE UP THE GANTLET, to accept a

challenge. *Note.*—GAUNTLET is a common spelling, but GANTLET is the better and original form.

GANTLET (in TO RUN THE GANTLET), or GANTELOPE, *găn′tĕl-ōp* [Sw. *gatlopp*—from *gata*, a street, a line of soldiers; *lopp*, a course, or from *gang*, passage, and Dutch *loopen*, to run—comp. *elope*]: to run through a company of soldiers or sailors standing in two rows, making a lane, each having a switch or knotted cord in his hand to scourge the criminal, who is naked to the waist. *Note.*—It will be seen that the expression *to run the gantlet*, has no connection with GANTLET or GAUNTLET, but is a mere corruption of *gantelope*, or *gangloop*.

GANTUNG PASS: mountain road leading e. from Kunawar, a district of Bussahir in Hindustan, into Eastern Tartary; lat. 31° 38′ n., and long. 78° 47′ e. It is 18,295 ft. above the sea, and is overhung by Gantung peak, about 3,000 ft. loftier. The place is unspeakably desolate and rugged. It is beset with perpetual snow, and being devoid of fuel, is little traversed. Gerard, one of the few travellers that has visited it, crossed it—and that in July—amid snow and sleet; he reports the whitened surface as presenting here and there dangerous pools of still water.

GAN′YMEDE: see PLANETOIDS.

GANYMEDES, *găn-ĭ-mē′dēz:* in classic mythology, cup-bearer of Zeus. According to Homer, he was son of Tros; according to others, of Laomedon, Ilus, or Erichthonius. The most beautiful of mortals, he attracted the notice of the king of the gods, who despatched his eagle to carry him off to heaven, where he succeeded Hebe as cup-bearer. The Greeks believed that Zeus gave Tros a pair of divine horses as a compensation for kidnapping his boy, and comforted him at the same time by informing him that Ganymedes had become immortal and free from all earthly ills. At a later period Ganymedes was identified with the divinity who presided over the sources of the Nile. The Greek astronomers likewise placed him among the stars, under the name of Aquarius (the water-bearer), in allusion to his celestial function. Ganymedes was a favorite subject of ancient art.

GAOL, n. *jāl*, in the *United States*, usually written JAIL [F. *geôle*, a gaol—from OF. *gaiole*—from It. *gaiola* for *gabbiola*, a cage—from mid. L. *gabĭŏlă*, a cage—from L. *cavĕă*, a cage, a coop; *cavus*, hollow: comp. Sp. *gayola*, a cell for mad persons: Gael. *gabhar*, a gaol—from *gabh*, to take; to seize]: a place of confinement for criminals; a prison: see PRISON: V. to confine in a prison. GAOL′ING, imp. GAOLED, pp. *jāld*. GAOL′ER, n. the keeper of a gaol or prisoner. GAOL-BIRD, one who has been confined in a gaol. GAOL-DELIVERY, the clearing of a prison of accused persons by bringing them to trial. COMMISSION OF GAOL-DELIVERY, in *England*, is one of the four commissions issued to judges of assize, under which they discharge their duties on circuit: see ASSIZE. Commission of goal-delivery empowers

the judges to try and to deliver every prisoner who shall be in the gaol when they arrive at the circuit town. It is not incumbent on the commissioners to deliver all the prisoners in the gaol, but they cannot try any one who was not in custody or on bail at the opening of the commission. A commission of gaol-delivery has power to order that the proceedings at any trial shall not be published till all the trials are finished.

GAP, n. *găp* [AS. *geap*, wide; *geapan*, to gape, to open: Icel. *glapa*, to stare; *gapa*, to gape: Norw. *gap*, a passage: Gael. *gab*, a mouth]: any opening; a hiatus; a breach; a hole. To STOP A GAP, to patch up or make a shift for a time. To STAND IN THE GAP, to stand forward in the post of danger, as a defender. GAPE, v. *gâp* or *gāp*, to open the mouth wide, as from drowsiness or dullness; to yawn; to open, as a crevice: N. a gaping; a yawn; the opening between the mandibles of birds. GA'PING, imp.: ADJ. opening like a crevice or large crack; opening wide the mouth. GAPED, pp. *gâpt* or *gāpt*. GA'PER, n. one who stares foolishly. GAPES, n. plu. *gâps* or *gāps*, serious disease of poultry and birds, in which they open their mouths wide and gasp for breath, caused by the presence of the parasite trematode worm in large numbers in the trachea, or in the lungs. See GAPES. To GAPE FOR OR AFTER, to desire earnestly; to long for; to stare or gaze. To GAPE AT, to stare in a wondering manner.—SYN. of 'gap': defect; flaw; break; chasm;—of 'gape, v.': to gaze; stare.

GAP, *gâp:* small town of France, cap. of the dept. of Hautes Alpes, pleasantly situated on the right bank of the Luie, about 50 m. s.e. of Grenoble. It is approached through walnut avenues, and surrounded by slopes on which the vine flourishes 2,558 ft. above sea level. Seen from a certain distance the town is picturesque; but on closer inspection, it is found a labyrinth of dirty, narrow and ill-paved streets. The chief public building is the cathedral, with a mausoleum in marble of the Constable de Lesdiguières. The town has manufactures of coarse woolens, linens, agricultural implements, and leather. Gap, the anc. *Vapincum*, was formerly cap. of the district of Dauphiné to which it gave the name of Gapencois. At the commencement of the 17th c., it is said to have had about 16,000 inhabitants. Since that period, however, it has steadily declined in size and importance, having now about 11,000 inhabitants. It was sacked, and almost wholly reduced to ashes, by Victor Amadeus of Savoy 1692.

GAP, AIR. See ELECTRICAL MACHINES.

GAPES, *gâps* or *gāps:* disease affecting domestic fowls and some other gallinaceous birds; due to a nematode worm (*Syngamus trachealis*) in the throat. Though differing in appearance this worm is allied to the fluke worm (see FLUKE), which attacks and often proves destructive to sheep. Its presence produces inflammation, causes difficulty in breathing, and if neglected may prove fatal.

The causes are impurities in drinking water and damp and unclean quarters. The indications are frequent gaping, stretching the neck, lassitude, and general debility. Remedies: Thorough cleansing and disinfection of the yards and pens is imperative. The affected birds are to be separated from the remainder of the flock and put into barrels into which some dry air-slacked lime should then be thrown. The dust will cause violent coughing which will probably dislodge the worms. If not successful, or if lime is not at hand, the tip of a feather may be moistened with spirits of turpentine, or with carbolic acid and glycerine, in the proportion of 20 drops of the former to an ounce of the latter, and passed down the windpipe: turn it around several times and withdraw quickly; repeat with another feather until no more worms are removed. Light food should be given for a few days and a little camphor in the drinking water will be beneficial.

GAR, v. *gâr* [Icel. *gera*, or *göra*, to make, to do: Bret. *gra*, affair, business]: in *Scot.* and *prov. Eng.*, to cause; to make one do a thing; to compel; to force. GAR'RING, imp. GARRED, pp. *gârd*.

GAR. See GARFISH.

GARAGE, n. *gâr'ēj*, or *gâ-râzh'* [Fr.]: a building for the storage of automobiles and other motor-propelled vehicles.

GARANCINE, *găr'an-sĭn:* manufactured product of madder; hence its name, from Fr. *garance*. The discovery of the process for making this material is due to the French; and it has proved one of the most valuable additions of the present century to our dyeing materials. It was practically used first in the dyeing establishment of Messrs. Lagier and Thomas at Avignon, where it was introduced with the hope of turning the spent madder to account; but the rude manner in which it was prepared long prevented its general use and ignorance of the organic chemistry of madder at first hindered its improvement. It was first prepared by drying and pulverizing or grinding the spent madder which had been used in the ordinary process of dying madder styles; this was then saturated with sulphuric acid, which was supposed to char the woody tissue and destroy the *alizurine* and some other organic products of the madder, but to have no effect upon the purpurine, which was constantly available for fresh dyeing processes. Subsequent experience showed these views to be wrong, and garancine is now prepared from pure ground madder-root which has not previously been used. For this purpose, the ground madder is mixed with water, and left for a day; then fresh water is added, and the whole drawn off. By this means, the sugar, and probably the whole of the rubian, another principal of the madder, are dissolved and removed. Sulphuric acid is then added, and the temperature raised to about 90° F. for some hours, after which it is well washed with cold water, strained, pressed, and dried, and afterward ground.

In this state, it has a fine chocolate-brown color, and somewhat resembles ground coffee. The advantages of garancine over madder are, that it is more easily used, and the colors which it gives are brighter and more intense, though not so permanent.

GARAY, *gŏr'oy*, JÁNOS: 1812–1853, Nov. 5; Szegszárd: Hungarian poet. Garay's poetical genius manifested itself from early boyhood; for it was noticed by his teachers, that whenever he had to make a school *pensum* of Latin verses, he would usually bring at the same time an elaborate Magyar version. His *Csatár* (the Warrior) was published 1834, and from that time till his death, Garay was one of the most assiduous workmen in the field of Hungarian literature, being attached in succession to the editorial staffs of the *Regélöi*, *Rajzolatok*, *Hirnök*, and *Jelenkor*. His dramatic works are—*Csáb*, tragedy in five acts (1835); *Arbocz*, tragedy in five acts (1837); *Országh Ilona*, historical drama in three acts (1837); *Utolsó Magyar Khan*, tragedy in five acts; *Báthory Erzsebet*, historical drama in five acts. The first complete edition of his poetical works was published at Pesth 1843. A collection of tales appeared under the title *Tollrajzok*, 1845; and the historical legends of Hungary, under the title *Arpádok*, 1847. A new series of poetry, *Balatoni Kagylók*, was published 1848. He died at Pesth. His last work was *Szent László*, a long historical poem in 12 cantos (2 vols., Erlau 1850). A complete edition of his poems was published after his death by Franz Ney (Pesth 1853); and a select number have been translated into German by Kertbeny (Pesth 1854; 2d ed. Vienna 1857).

GARAY, JUAN DE, *hoo-ân' dā gâ-rī'*, Spanish soldier: b. Badajoz 1541; d. South America 1584. About 1565 he went to South America, where he became secretary to the governor of Paraguay, was sent on a voyage up the Paraná, discovered a vast territory, and founded near the river the town of Santa Fé de Vera Cruz. He defeated the Charruas Indians not far from the Uruguay, received the commission of lieutenant-general, and was appointed (1576) governor of Asuncion. In 1580 he re-founded the city of Buenos Ayres on its previous site, and subsequently did much to improve the condition of neighboring native tribes. Having landed in an unfamiliar region on a journey up the Paraná to Asuncion, he was there killed by hostiles.

GARB, n. *gârb* [OF. *garbe*, gracefulness: Sp. *garbe*, grace: It. *garbo*, comeliness, behavior]: dress; clothes; mode or fashion of dress.—SYN.: guise; habit; clothing; fashion; mode.

GARB, or GARBE, n. *gârb* [F. *garbe;* O.H.G. *garba*, a sheaf]: in *OE.*, sheaf of any kind of grain. It is frequent in heraldry. If blazoned a garb simply, wheat is understood; if any other grain is intended, it must be mentioned —e.g., 'a garb of oats.'

GARBAGE—GARBAGE, PUBLIC DISPOSAL OF.

GARBAGE n. *gâr'bāj* [Gael. *garrbhuaichd*, the filth about sheep or cattle inclosed—from *garr*, filth: Sp. *garbillare*, to separate the bad from the good: comp. F. *grabeau*, refuse of drugs]: the refuse of flesh or vegetables; the bowels of an animal; offal.

GARBAGE, PUBLIC DISPOSAL OF: When thrown upon the ground and allowed to decompose, or when used as a fertilizer in a raw state, garbage may contaminate sources of water supply, and thus become a menace to public health. In country districts and in most towns and small cities it is used as food for domestic animals, and when fresh no more proper disposition of it can be made. When the material is allowed to become partially decomposed before feeding, and where caustic solutions are used for the cleansing of cooking utensils, etc., the mortality caused thereby, particularly among hogs, is so serious as to preclude its use. American cities produce from one half pound to one pound per day for each person. European cities produce less than one half of this amount for each person. Analysis of American city garbage shows moisture 70 per cent. to 80 per cent.; grease, 2 per cent. to 3 per cent; and solids, principally wood fibre, 18 per cent to 28 per cent. Garbage from European cities contains more solids and less of moisture and grease

Compared with the garbage of New York city, British garbage contains about 25 per cent. and German about 50 per cent. less water. Practically, France has no garbage.

No other problem so far encountered has so troubled city officials and boards of health as the disposal of garbage. The first attempts at collection and disposal are crude and imperfect. All kinds of household wastes are put together in boxes or barrels and teams are hired to cart it away. In some cases the city owns the horses and wagons required for the work. This lasts until there is no longer a dumping place within hauling distance. In a few instances it has been taken to sea in scows and dumped in deep water. This is found objectionable, as the lighter portions float to shore. Total destruction of the material is the next resort. Inventors and promoters take advantage of the situation, and it is proposed to burn or utilize the material at huge profit. Corporations are formed, stock is sold, and plants are built for final disposal. Then there are indignation meetings and injunction proceedings. No one wants a garbage-disposal plant near his property. Should it be completed and started, it is generally closed within a year, either by injunction or owing to the lack of funds for its operation. The country is strewn with such wrecks. From one to a half dozen can be found in almost every city. Many are so utterly worthless in practice as to approach very nearly to the ridiculous. Others are admirable in design and construction, but fail on account of insufficient returns or excessive cost of operation. Much has been learned, however, through these failures.

GARBAGE, PUBLIC DISPOSAL OF.

It has been found that when garbage is mixed with ashes, paper, and other household waste, final disposal is rendered very difficult, the mass being unfit for filling, fuel, or fertilizer. Leading American cities separate household waste into three parts, namely, 'food waste'. 'combustible waste', and 'non-combustible waste'. By this means final disposal is more readily effected, each class of waste having properties of commercial value when kept separate from the others. Most European cities do not attempt a separation, except it be at the plant where final disposal is effected. In some cases the whole mass is passed through what are termed 'destructors', burning the unconsumed carbon found in the ashes, and the combustible portions of other household waste. This system of final disposal has not been found satisfactory in American cities, and has been equally unsatisfactory in some European cities, particularly on the Continent, where, as in America, it is found that much additional fuel is required in order to maintain a proper temperature in the furnaces. Many of them have, therefore, been abandoned altogether, and attention has been turned to some form of utilization as being more reliable and less expensive.

Much impetus was given to effective practical development of the principle of utilization by the determined efforts of the late Col. Geo. E. Waring, New York's indomitable commissioner of streets. After a most exhaustive investigation of the whole subject, and a thorough inspection and test of every system of disposal then in existence, both in Europe and America, Col. Waring became thoroughly convinced that utilization was right in principle and practice, and proceeded at once to have garbage of the city of New York disposed of in this manner.

The system adopted by Col. Waring, and which is now in use in many of the principal cities of the United States, is first, thorough sterilization by subjecting the material to the action of live steam in enclosed vessels, condensing all vapors and passing insoluble gas through flame. By this treatment the structure of the material is broken down,—even bones are disintegrated,—the liquids carrying the oils and greases being separated from the solids by mechanical means. The further preparation of the ingredients, by which they are put in commercial form or finally disposed of, varies greatly in the different plants In some cases the liquids are evaporated, in others they are allowed to run into sewers or water courses. In a number of the plants the solid portions are used for fuel; in others they are acidulated or dried and prepared as a base for commercial fertilizers. The greases are sometimes extracted by the use of a solvent, and reclaimed by evaporations, the solvent vapors being condensed and also reclaimed to be used again. The principles involved are not new, having been applied for many years to the treatment of slaughter-house waste. In its application, however, to the greater subject of garbage

disposal, much new apparatus has been invented, and the plants have been equipped to handle very promptly a vast amount of the material; the plant which disposes of the entire garbage of the Greater New York having a daily capacity of more than 2,000 tons, and the plants located in Philadelphia, Pa., Boston, Mass., Newark, N. J., Baltimore, Md., Washington, D. C., Detroit, Mich., St. Louis, Mo., Cleveland, O., and in some of the smaller cities, are of sufficient capacity to dispose of all the garbage produced in the respective cities within 12 hours of delivery at the plant.

The state of the art as to final disposal would seem to preclude the utilization systems in cities having a population of less than 50,000, excepting where a combination plant can be used, thus disposing at one plant of all garbage, dead animals, slaughter-house waste, butchers' scrap, etc. Where this cannot be effected, it has been found that burning is the only safe and effectual means of disposal.

GARBLE, v. *gâr'bl* [Sp. *garbillo*, a coarse sieve; *garbillar*, to garble, to sift: OF. *garbeller*, to examine precisely, to sift nearly: Ar. *ghirbal*, a large sieve: comp. Gael *garbh*, thick, rough; *buaile*, to strike out—*lit.*, to sift out the refuse]: to strike out the thick or prominent parts; to pick out and choose such parts from a statement, a writing, or an author, as may serve a purpose—usually in a bad sense; to mutilate. GAR'BLEABLE, capable of being garbled; liable to be garbled. GAR'BLING, imp.: N. a picking or sorting. GAR'BLINGS, n. plu. the worst kind, or the refuse, of any commodity. GAR'BLED, pp. *-bld:* ADJ. separated or picked out to serve a purpose. GAR'BLER, or GAR'BELLER, n. *-blėr*, one who; a sorter and cleanser, as of spices. GARBLES, n. plu. *gâr'blz*, the dust, soil, or dross separated from good spices or drugs, etc. GAR'BELLED, a. *-bĕld*, in *com.*, sorted or picked. *Note.*—Perhaps GARBAGE is derived from the same sources as GARBLE, or there may have been a confusion of GARBLE with OF. *garber*, to collect—see Skeat.

GARBOIL, n. *gâr'boyl* [OF. *garbouil;* It. *garbuglio*, confusion: Sp. *garbullo*, a crowd, a multitude]: in *OE.*, great confusion; disorder; hurly-burly.

GARCIA, CALIXTO: a Cuban patriot; 1836, Oct. 14—1898, Dec. 11; entered the law profession. In 1868 he aided in organizing the revolution against Spain, which is known as the Ten Years' War. He was made brig-gen. under Gomez and afterward succeeded the latter as commander-in-chief of the Cuban army. In 1873 he was captured by the Spaniards and sent to Spain. On being pardoned 1878, he returned to Cuba, where he again fought against Spain in what was called the Little War. He was a second time captured and detained in Spain for 17 years under surveillance of the police. In 1895, he escaped to Cuba via the U. S. In 1898, when the Americans took Santiago, he withdrew from the Cuban

army because he was not given command of the city. He soon accepted the new conditions, and in Nov. of the same year became chairman of a commission to lay before President McKinley the wishes of the Cuban leaders.

GARCIA, *gâr'sē-a*, Sp. *gār-thē'â*, MANUEL: 1775–1832, June; b. Seville, Spain: musician. After acquiring reputation as a singer in Cadiz and Madrid, he went to Paris 1808, where he obtained great success at the Italian opera; and 1811 went to Italy, where he found equal favor in Turin, Rome, and Naples. He was constantly engaged as a singer, either in Paris or London, 1816–24. Subsequently he visited New York and Mexico. Many of Garcia's pupils reached great excellence, but none equalled his eldest daughter Maria, afterward Madame Malibran (q.v.).

GARCIA, MANUEL, Spanish professor of singing in England: b. Madrid, Spain, 1805, March 17; d. London, England, 1906, July 1. He was a son of the preceding. He invented the laryngoscope, and published: *Memoire sur la voix humaine* (1840); *Trâite de la Chant* (1841); *Hints on Singing;* etc.

GARCILASO, *gâr-thē-lâ'sō*, surnamed (by himself) the *Inca:* 1540–1616; b. Cuzco, Peru; son of Garcilaso de la Vega, who belonged to the same family as the poet of that name, and was one of the conquerors of Peru. Garcilaso's father married Elizabeth Palla, Peruvian princess of the race of the Incas, niece of the famous Huayna Capac, the last emperor of Peru; and Garcilaso, though a Spaniard and a Christian, was exceedingly proud of the royal blood which flowed in his mother's veins. During the greater portion of his life he lived at Cordova, where he died. His first work was *History of Florida* (*La Florida del Ynca.* Lisbon 1605). In 1609 appeared the first, and 1616, shortly before his death, the second part of his work on the *History of Peru*, entitled *Commentarios Reales que tratan del Origen de los Incas de sus Leyes y Gobierno*, valuable as being almost the only source of information which we possess concerning the ancient Peruvians.

GARCILASO DE LA VEGA, *gâr-thē-lâ'sō dā lā vā'ga:* 1500 (or 1503)—1536, Nov.; b. Toledo: Spanish soldier and poet. He early adopted the profession of arms, and gained distinguished reputation for bravery in the wars by Emperor Charles V. against the French and Turks, but was mortally wounded while storming a castle near Fréjus, in the s. of France, and died at Nice, in the thirty-third year of his age. Garcilaso though prematurely cut off, lived long enough to win immortality as a poet, and though he wrote little, he revolutionized the national poetic taste of his countrymen. For the short metre of the older romances and redondillas, he substituted the hendecasyllable verse of the Italians. His pieces consist of only 37 sonnets, 5 *canzones*, 2 elegies, 1 epistle, and 3 pastorals. Strangely, they show no trace of military ardor, but are inspired by a tender sweetness and melancholy which appeared to have deeply affected his countrymen. 'His

sonnets', says Ticknor, in his *History of Spanish Literature*, 'were heard everywhere; his eclogues were acted like popular dramas. The greatest geniuses of his nation express for him a reverence they show to none of his predecessors. Lope de Vega imitates him in every possible way; Cervantes praises him more than he does any other poet, and cites him oftener. And thus Garcilaso has come down to us enjoying a general admiration, such as is hardly given to any other Spanish poet, and to none that lived before his time.' The best of the numerous editions of Garcilaso's poems is that by Azara (Madrid 1765). They have been translated into English by Wiffen (Lond. 1823).

GARCIN'IA. See MANGOSTEEN.

GARÇON, n. *gâr'sŏng* [F. *garçon*, a little boy—from *gars*, a boy: comp. Gael. *gasar*, a little fellow]: in *France*, a boy, a lad; a young man; a waiter; a messenger.

GARD, *gâr:* department in s. France, bounded e. by the river Rhone. It is triangular in shape, its s. extremity reaching into the Mediterranean in a headland which has a coast-line of about ten miles. Its total area is 2,250 sq. miles; one-third arable, one-third waste land, the remainder occupied by forests, plantations, vineyards, and, on the coast, by extensive and unhealthful marshes. It is watered mainly by the Rhone, and by its tributaries, the Gard—from which the dept. has its name—and the Ceze. Of its surface, the n.w. is occupied by a branch of the Cevennes; the remainder slopes toward the Rhone and the Mediterranean. The soil is in general dry, the best land occurring in the river-valleys. Coal is found in several places and salt-works are extensively carried on in the south. The vine (which yields about 26,400,000 gallons of wine annually, the olive, and the mulberry are principal products. The chief manufactures are silk, woolen, and cotton goods; hats, ribbons, gloves, etc. Wine is largely exported. The dept. is divided into the four arrondissements of Nîmes, Alais, Uzès, and Le Vigan: the chief town is Nîmes.—Pop. about 420,000.

GARDA, *gâr'dâ*, LAGO DI. one of the most remarkable of the Alpine lakes, and the largest in Italy; the Lacus Benacus of the Romans. Its modern name is from the small village of Garda, on its e. shore, containing 3,000 inhabitants Garda's chief tributary is the river Sarca, which rises from the glacier of Monte Adamo, but it receives several smaller streams descending from the valleys of Ledro, Tavalo, and Vesta. The n. extremity of the lake enters the territory of Trent in the Italian Tyrol. On the e. it has the province of Verona; on the w., that of Brescia; on the s., that of Mantua. Its greatest length, from Riva to Peschiera, is 32 m.; its breadth, from Desenzano to Garda, 10 miles. Its depth is very variable; the average generally exceeds 120 ft.; in the direction of Mallesine, it reaches 700 and 800 ft.; and its maximum as yet ascertained is 950 English ft. The principal islands are Trimelone, Olivé, and St. Pietro. The scenery is grand. Alpine spurs

border the lake on both sides, and descend steeply to its shores, but enfold also many beautiful and fertile valleys. The waters of this lake are remarkably clear, and abound in fish of various kinds. Owing to the extent of its surface, and the violent winds to which it is exposed, waves often rise on it to a considerable height, giving it the appearance of a rough sea. The only outlet is the river Mincio at Peschiera, which descends to Mantua, and discharges itself into the Po. The mild climate in the district of the lake, and the beauty of its vicinity, have caused its shores to be lined with beautiful villas. Especially attractive to the scholar is the neck of land called *Sermione* (the *Sirmie* of Catullus), where the remains of that poets' country house are still traceable. After the peace of Villa-franca, Lake Garda formed the barrier which separated Venetia from the kingdom of Italy.

GARDAIA, *gâr-dī'â*, or GHARDEIA, *gâr-dā'yâ:* important trading town of Algeria, in the Sahara; chief town and seat of the Djemmâa or elective council of the Republic of the Seven Cities of the Mzab district; situated amid savagely naked and rocky mountains, lat. 32° 28′ n. and long. 4° 38′ e.; 312 m. s.s.e. of Algiers. It is fortified by an enclosing wall which is surmounted by nine towers and pierced by ten gates; contains six mosques, one remarkable for great size; and has a flourishing trade by caravans with Tunis, Algiers, Fez, Morocco, Sudan, and Timbuctu, in slaves, dates, barley, pottery, provisions, oil, wool, cotton, indigo, leather, gold-dust, ivory, and all the varied raw produce of central and n. Africa. Gardaia is surrounded by extensive orchards, irrigated from wells, some of which are 900 ft. deep. In the vicinity are the ruins of a tower, supposed to have belonged to the Romans. The Mzab republic or confederacy pays to the French an annual tribute of 30,000 francs, 14,000 francs of which are contributed by Gardaia alone. In return for this, the French secure them from all wars and marauders, and open to them freely the markets of the coast regions of Algeria. Pop. 27,000.

GARDANT, *gârd'ant*, in Heraldry, applied to an animal as represented full-faced, and looking forward: see PASSANT-GARDANT.

GARDELEGEN, *gâr'dė-lā-ċhėn:* small town of Prussian Saxony, about 30 m. n.n.w. of Magdeburg, on the Milde. It has manufacturers of leather, several mills and distilleries and five annual fairs. Gardelegen is very old. Tradition says that in ancient times it was called Isenburg (*Castrum Isidis*), from being a sanctuary of the goddess Isis, and that it was destroyed by the Franks. Be this as it may it was certainly destroyed by a Duke Dervan A.D. 633, and rebuilt about 924. Subsequently, for a long period it was the seat of princely markgrafs, called Counts of Gardelegen. Until 1478, it remained a free town. Pop. 7,500.

GARDEN, n. *gâr'dn* [OF. *gardin;* F. *jardin*—from Goth. *gards;* Ger. *garten*, a garden: It. *giardino*]: an in-

closed cultivated space in which flowers, fruits, vegetables, etc., are reared; a large, well-cultivated, and fruitful territory: V. to cultivate a garden. GAR'DENING, imp. *-dn-ĭng:* N. the act or art of laying out and cultivating ground as gardens. GARDENED, pp. *gâr'dnd.* GARDENER, n. *-dn-ėr,* one who has charge of a garden, or who cultivates one. KITCHEN-GARDEN, an inclosed space where culinary herbs and vegetables are raised. For var. of G. see GARDENING.

GARDEN, MARY, Scottish-American singer: b. Aberdeen, Scotland, 1876. She removed to America when a child, studied singing in Chicago and other cities and afterward went to Paris. She first came into prominence through her success in the title rôle of Charpentier's opera, *Louise,* at the Opéra Comique. Her most noticeable achievement has probably been her creation of Mélisande in Debussy's opera, *Pelléas et Mélisande.* Made her American debut in N. Y., Nov. 1907, in Massenet's *Thaïs.*

GARDEN, ALEXANDER, Scottish scientist: b. Charleston, S. C., about 1730; d. London 1791 April 15. He was graduated from Aberdeen; became a professor in King's College, New York (now Columbia University), and in 1755 established himself in medical practice at Charleston. During the Revolution he sided with Great Britain and from 1783 he was in London, where he became vice-president of the Royal Society. The botanical genus *Gardenia* (q.v.) was named in his honor by Linnæus. He wrote various papers on topics of botany and zoology.

GARDE NATIONALE, *gârd nâ-sĭ-ō-nâl':* celebrated burgher defenders of order in Paris and certain other French towns; introduced into Paris first during the Revolution of 1789. It had existed for a long time in some of the French towns, at first for defense of the rights and privileges of the city, subsequently for guarding the persons and property of the citizens. When, 1789, July, all of the lower orders of the capital rose and demanded arms, the leaders of the Revolution, sitting at the Hôtel de Ville, seized the opportunity to decree, without consulting the government, the formation of a national guard for Paris of 48,000 citizens, which in the first instance, they named the Parisian Militia. Each electoral district was to enroll a battalion of 800 men, divided into four companies of 200 men each, 15 of these companies forming a legion. The officers of the battalions were to be elected by the privates; but the higher officers were named by the Committee. The device chosen as the badge of the service was of blue and red, the colors of the city, to which white, the color of the army, was added. Thus arose the celebrated tricolor, afterward adopted as the national badge, and now borne in honor wherever the French name extends. On the king consenting to the removal of the regular troops from Paris, Lafayette (q.v.) was named commandant of the national guard of the city. Ere many more days had elapsed, the friends of municipal freedom had organized themselves into burgher troops in every important town, and the

National Guard had become a recognized institution of the whole kingdom, the entire number raised being not less than 300,000. The force soon acquired an extraordinary degree of discipline and efficiency.

Throughout 1789, the National Guard looked on supinely at the excesses of the democratic party in the provinces, and joined the mob in Paris during the atrocities of Oct. 5; but, under Lafayette, better counsels prevailed, and the national army restored order, rescuing the royal family Oct. 11. For some months after this time, the National Guard firmly withstood the more violent insurrectionists, who would have deluged the capital with blood; but irresolution and indecision marked their action, 1792, Aug., and they stood tamely by during the appalling massacres in the prisons. As the Revolution held its sanguinary course, the National Guard receded more and more from the moderate views which it had at first supported, until, in 1794, it was among the most devoted adherents of Robespierre and his bloody triumvirate, ever ready to give its aid in the execution of their merciless decrees. Later in the year, however, when the Reign of Terror stood balanced between power and death, the National Guard proved, under the command of Barras, faithful to the Convention, which had deposed Robespierre and his terrible colleagues. In 1795, the National Guard aided in the disarmament of the populace; the reign of the multitude ceased, and the force itself was thoroughly reorganized, all elements of internal turbulence being carefully excluded from its ranks. Under this constitution, none were eligible to serve as National Guards but citizens of substance, laborers and the lowest classes being deemed dangerous. Not many months later, so great was the reaction, that the corps had become quite royalist in its feelings, carrying their sympathies at length to open rebellion against the Convention; but they sustained an utter defeat from a small body of troops of the regular army, who, under Barras and Napoleon Bonaparte, defended the Convention. After this reverse, the National Guard ceased practically to exist. It is worthy of remark that in 1794 Napoleon had been offered the command of the National Guard by Robespierre, and had declined it; had he accepted it how different might have been the fate of Europe.

In 1805, on the eve of the great continental campaign, which he expected would denude France of its regular troops, Napoleon re-instituted the Garde Nationale, taking care, however, that no elective or democratic principles should pervade the body. By a decree of Sep. 23, in which the whole empire was included, every man in good health was required to serve, between the ages of 21 and 60; the officers were to be named by the emperor. The companies were localized among the villages and townships; ten companies formed a cohort, and several cohorts, according to the district, formed a legion. This force was maintained in succeeding years in discipline and efficiency; and 1812, before the great Russian campaign, the emperor placed a large portion of the

National Guard on permanent duty. He reaped the advantages of this step when, 1813, after the disastrous issue of that year's warfare, he found 100,000 well-drilled steady troops ready to replace his lost veterans, and fill some of the vacancies in the ranks. In 1814—when advancing to meet the allies, he parted from his empress and his son, the little king of Rome, for the last time—Napoleon solemnly committed them to the protection of the National Guard of Paris. After the Bourbon restoration, the National Guard continued an important body in the state until 1827, when its attitude becoming insubordinate, Charles X. dissolved it, but neglected to *disarm* the members. Enraged at this slight, these men were among his most formidable opponents at the revolution of 1830. Under Louis Phillippe, in that year, the Garde Nationale was re-established throughout France, Lafayette being appointed to the command-in-chief, a post, however, from which he was removed shortly afterward, as his power became dangerously great. In 1831 the National Guard of Lyon was implicated in the insurrection there; and in the following year, a considerable portion of the urban legions of Paris took part in the sanguinary disturbances of the Quartier St. Meri, in which, however, they were overcome by the firmness and fidelity of the suburban legions of the *banlieu*. Feeling its power over the Citizen King of its own creation, the National Guard verged more and more toward Republican principles, until, in the critical moments of the reform insurrection of 1848, the guard of the capital deserted from Louis Phillippe to the revolutionists, and so put an end to the Orleans dynasty. In the troubles of the spring and summer of 1848, the Garde Nationale—excepting a few legions subsequently dissolved—steadfastly supported order, and opposed the Socialists. On the election of Louis Napoleon to the presidency, he found it necessary to dissolve the Guards in 153 communes; and he re-organized the remainder on a footing to insure the absence of Socialistic views.

By an ordinance of 1851, June, the Garde Nationale was placed nearly on the footing of Louis Phillippe's reign; but by a decree of 1852, which held till 1870, Sep. 4, the entire force was dissolved, and reformed on a more military basis, in certain departments only. During the Franco-German war the Garde Nationale was divided into sedentary and active battalions. After the defeat of the Commune 1871, the French National Assembly decreed to dissolve the Garde Nationale, leaving the prefects of departments to choose the time of executing the decree. At present this body may be considered abolished.

GARDEN CITY, N. Y., a village on Long Island in Nassau County; on the Long Island railroad; 18 miles east of New York. It was founded by Alexander T. Stewart as a residential town. It is the seat of the Protestant Episcopal bishop. of Long Island, and contains the Cathedral of the Incarnation. Here are also the Cathedral Schools of St. Mary and St. Paul. Pop. 1,500.

GARDENIA, *gâr-dē'nĭ-a:* genus of trees and shrubs, of nat. ord. *Cinchonaceæ*, natives of tropical and sub-tropical countries, many of of which are now favorites in European and American green-houses and hot-houses for their beautiful and fragrant flowers. Some are hardy enough to endure the open air in summer. The corolla is funnel-shaped, or approaching to salver-shaped, the tube much longer than the calyx; the fruit is a berry crowned with the calyx. *Gardenia florida* and *Gardenia radicans* are among the species best known in Britain and bear the name of Cape Jasmine, but are natives of Japan. The fruit of the former, about the size of a pigeon's egg and orange-colored, is sold in the shops of China and Japan for dyeing silks yellow. A beautiful yellow resin exudes from wounds in the bark of *Gardenia arborea* and *Gardenia gummiferi*, Indian species. The wood of *Gardenia Thunbergii* and *Gardenia Rothmannia* is very hard, and is used for agricultural implements, wheel axles, etc., at the Cape of Good Hope.

GARDENING, or HORTICULTURE: arrangement, cultivation, and general management of a garden.

The earliest known gardens are those of Solomon which are described as having been of quadrangular form, surrounded by high walls. They contained aviaries, wells, and streams of water. The gardens of Cyrus and other Persian monarchs were of great extent, and generally laid out in romantic situations. They were also distinguished for the great diversity of their uses and products. The first allusion to terraces in gardens is to be found in the description of the celebrated hanging gardens of Babylon, anciently reckoned among the wonders of the world. Diodorus and Strabo have given descriptions of them. They are said to have formed a square with an area of nearly four acres, and rose in terraces, supported on masonry arches, to a height of 75 feet. They were irrigated from a reservoir built at the top, to which water was lifted from the Euphrates by a screw. Fountains and banquet-rooms were distributed throughout the numerous terraces; groves and avenues of trees, as well as parterres of flowers, diversified the scene; while the view of the city and neighborhood was extensive and magnificent. Most of the elements of a modern architectural garden are alluded to in connection with those of Babylon. The grove of Orontes, described by Strabo, must be regarded as a park or large garden in the picturesque style; it was nine miles in circumference.

In ancient Greece, gardening was rather a neglected art at first, but in process of time great advance was made. The vale of Tempé, the Academus at Athens, and other public gardens, were extremely elegant, and were ornamented with temples, altars, tombs, statues, monuments, and towers. The Greeks copied their gardening from the Persians; and the Romans, in their turn, copied that of the Greeks. Little is known of the early style of

Roman gardening; the vast edifices projecting into the sea, and the immense artificial elevations, are apparently ridiculed by Cicero and Varro. About this time, however, began the cultivation of odoriferous trees and plants; and the planting of trees adjoining each other, whose odors assimilated, was then as much a study with the gardener as the harmonious blending of colors at the present day.

The early French and Dutch gardens were evidently adopted from the description of Pliny's garden. The use of glass in the construction of conservatories was early known to the Greeks and Romans; and the 'Gardens of Adonis,' mentioned by some of their most eminent authors, were probably of this kind. Gardening, like all other arts, languished during the Dark Ages, but with the revival of learning, the invention of printing, and the Reformation, it began again to flourish. The art was revived and patronized by the family of the Medici in Italy; and their gardens which were of the geometric and architectural style, long served as models for most of Europe. It continued to be imitated in France, Germany, and Great Britain till the introduction of the English or natural style. In garden architecture very little progress, as far as hothouses are concerned, has been made in southern Europe, the warmth of the climate rendering them all but useless. There are, however, plant houses in many places in Spain and Portugal. The French and Dutch gardens resemble each other closely; symmetry and profuse ornament are the characteristics of both. The Dutch style is eminently adapted to the nature of the country, where there are no inequalities of surface, as in England. The French style seems to have arisen about the middle of the 17th century, during the reign of Louis XIV. The most celebrated gardener of the period was Le Nôtre, who laid out the famous gardens of Versailles. Le Nôtre's style spread rapidly into other countries. The first erection of hothouses in France occurred toward the end of the reign of Louis XIV., by M. Fagon, in the Jardin des Plantes. The first magnificent attempt at hothouse building was that of Francis I., of Austria, in 1753. They were in five ranges, extending altogether to the length of 1,290 feet, many of them being 30 feet high. From about 1760 landscape gardening, and the adoption of the English style, rapidly spread into France, Germany, and Russia, where it still prevails.

Gardening is practically a branch of agriculture. Both are subject to the same principles, and many of the required operations are conducted in the same manner. But in general agriculture, what may be styled an extensive system is usually pursued, while in gardening the intensive method prevails. The one deals with spacious grounds and seeks more land: the other cultivates small fields, and by heavy manuring and thoroughly and frequently stirring the soil looks for large crops from limited areas.

GARDENING.

In agriculture the labor and fertilizers are given to the farm at large; in gardening they are concentrated on a very few acres.

The ordinary crops produced in a garden are the various culinary vegetables, fruits and flowers. By some writers the term gardening is made to include the care and planting of shrubs and ornamental trees, but this work seems more properly to belong to another field (see LANDSCAPE GARDENING). The cultivation of flowers should, to some extent, receive attention in every garden not devoted wholly to the sale of vegetables, but it must be one of the minor features of ordinary gardening (see FLORICULTURE). The larger fruits, too, such as the apple and pear, if grown on standard trees are out of place in small gardens. They require more room than can be well spared for their production. In large gardens they can be grown, to some extent, at the sides of the inclosure, but the natural place for this class of fruits is the orchard (see ORCHARD). In the market-garden those vegetables and small fruits which find ready sale are produced. In the kitchen-garden an abundance of culinary vegetables should be grown and strawberries and other small fruits ought always to be found. On too many farms the garden is a sadly neglected spot, though no part of the cultivated fields pays as well or yields such an abundance of palatable and healthful food. Land being abundant, the various details of planting and cultivation can be carried out with less labor and expense than is involved where space is limited and every foot of ground must be utilized, as is the case with market gardens and with kitchen-gardens in the vicinity of villages and large towns.

The location of the garden will be determined largely by circumstances which cannot be controlled; but where selection is possible, a situation protected from cold winds should be chosen. A sunny exposure also is desirable and, in case of the farm garden, it is important that it be near the house. If conveniently located it will often receive needed attention which would not be given if it were necessary to go to a distant field. A rich, mellow soil, free from stones, is to be preferred, but to a great extent natural deficiences in this direction can be supplied. If the land is wet and heavy, thorough underdraining will be required. Light soil needs liberal quantities of manure and careful cultivation, but can be made productive. When possible the garden should be much longer than it is broad: this in order that the crops which admit of horse cultivation may be planted in long rows, thus saving much time and a great amount of hand work. In gardens in which the useful and ornamental are combined broad and permanent walks are laid, and edgings of very low evergreens or of flowers are set along the sides, but these are not common and may more properly be considered under another head (see LANDSCAPE GARDENING).

In order to fit grass land for gardening, it should for

two or three years be applied to some hoed crop, which must be kept scrupulously free from weeds. Fertilizers should be liberally used. Land in other crops than grass, and which is desired for a garden, should be heavily manured, but if weedy should not be used for gardening until the foul plants have been thoroughly eradicated. Weeds in a garden are a source of endless trouble, involve a heavy loss of time and labor, and seriously injure the crops. It is, therefore, very important that as far as possible their introduction be prevented. Plowing may be done either in the fall or spring; but if the land is inclined to be heavy the fall is best, as the action of storms and frost will do much toward pulverizing the surface. The work should be well done, but the plow should not be run so deep as to turn up the subsoil. A liberal quantity of barnyard manure should be spread upon the surface before the land is plowed and a dressing of some commercial fertilizer (see FERTILIZERS) adapted to the crops which are to be produced may be profitably applied after the plowing has been done. Land plowed in the fall sometimes requires re-plowing in the spring, but this is determined entirely by the character and condition of the soil. In any case the surface must be made very fine and mellow, and in the portion devoted to crops which root deeply, as carrots and parsnips, the ground should be loosened to the depth of at least eight inches. The preparation of the land should be attended to as early in the spring as it is in condition to work, in order that the seed of the early vegetables may be planted without unnecessary delay. Where operations are conducted on a large scale it is best to place the early crops by themselves and prepare the land for later products when the season is further advanced, as it is highly beneficial to stir the surface soil just before the seed is sown.

The selection of the seed is a matter of very great importance, as upon the skill and success with which this is done the yield and quality of the crop will largely depend. The most liberal manuring, perfect preparation of the soil, and thorough cultivation cannot insure satisfactory returns if the seed is of a low quality. A great deal of seed which will germinate readily is either impure, untrue to name, or was produced by inferior plants, and is consequently wholly unfit to use. Sometimes seed is deficient in vitality and gives only weak and unprofitable plants, while in many cases it will utterly fail to grow. This may be due to weakness of the plants from which it was grown, to careless storage, or to deterioration by age. To prevent vexatious delays and losses, seed should be purchased only of well-known and trustworthy growers. The seed of plants desired for early use, as lettuce, or for transplanting as soon as the ground is warm, as cabbage, may be started in a cold frame or hotbed (see FORCING, in gardening; also HOT-BED). Where but few early plants are wanted it is sometimes cheaper to purchase than it is to attempt to grow them, but a cold frame will

be convenient and useful and should be found in every garden. Transplanting should be carefully done (see TRANSPLANTING). If the plants are in good condition and the weather is not extremely unfavorable, it will be almost uniformly successful. In sowing and planting, care should be taken to make straight rows as this will save much labor in hoeing and weeding. Prompt attention to all the details of the work is indispensable. Early sowing is essential to early maturity, which, in market gardening, is an important point, as the price often falls one-half in a few days after the first vegetables are offered for sale. It is also necessary where two crops are to be grown on the same ground in a single season, and is desirable where vegetables are grown only for home use. Early cultivation saves a vast amount of labor. Weeds when small are easily destroyed, but it is difficult to eradicate them when once established (see WEEDS). Their presence also proves a great injury to growing crops. The method of cultivation to be pursued will vary somewhat with the kind of crops produced and should be adapted to their specific requirements. To all plants grown in gardens clean cultivation is a necessity. It is a great but common error to till only for the purpose of keeping the land free from weeds. Tillage conserves soil moisture and in other ways promotes the growth of the plants, and frequent tillage is highly beneficial whether weeds are present or not. Many plants require careful guarding against the attacks of insect pests. The various small fruits which naturally find a place in the farm garden also need careful attention (see SMALL FRUITS). As different crops take the elements of fertility from the soil in varying proportions, it is not well to grow a crop on the same land for more than two years in succession (see ROTATION OF CROPS). To this rule there are very few exceptions, as onions, which do well for many consecutive years, while a few others, as cabbage, should have a new location each year. Wherever circumstances prevent the observance of this rule, care must be taken to supply fertilizers which are rich in the elements which the crop requires for its full development (see FERTILIZERS).

The special implements required in ordinary gardening are few in number, but they should be the best and most efficient of their kinds. In addition to the plows, harrows or pulverizers, cultivators, and hand implements in common use on the farm, a seed-drill and wheel-hoe (the combined form answers well for a small garden), a scuffle-hoe, a steel rake, and some weeding-knives, should always be at hand, and a light roller will be convenient and useful. For market gardening several other tools are needed (see MARKET GARDEN). As far as possible the use of implements should take the place of hand work.

While the ordinary operations of gardening are somewhat lighter than those of agriculture, the work demands the closest attention and a high degree of skill in order

GARDEN OF THE GODS.

1. Pike's Peak from the Garden of the Gods.
2. Interior of the Garden of the Gods.

to make it successful. Even when conducted merely to supply the family with fresh vegetables and small fruits, constant care will be required to keep down weeds, and skill will be needed to bring the land to the highest possible state of productiveness. In market gardening there is in addition to these points, need of great skill in meeting the strong competition which everywhere exists. In all gardening as far as possible, the ground must be made to produce two crops in a single season. Work must be planned so that the greatest degree of efficiency may be secured. Its rewards will then be reasonably sure and very liberal. To small landholders, especially in the vicinity of towns and cities, it offers an inviting field of industry. In districts which are favorably located, market gardening or trucking tends to become specially developed and the transportation facilities for handling the product are brought to a high state of efficiency (see MARKET GARDEN).

GARDEN OF THE GODS: a small region in Colorado, near Colorado Springs, in which are seen some of the most striking effects of erosion ever found upon the globe. The 'Garden' covers an area of about 500 acres, within which are strangely sculptured sandstone rocks, red and white, forms of grotesque magnificence— columns, 'cathedral spires,' and giant figures sometimes appearing almost as if made in human likeness. To many of these shapes have been given distinctive names suggested by their various formations. The road into the 'Garden' enters through the huge 'Gateway' of red rock-masses more than 300 feet in height.

GARDES SUISSES, *gârd swĭs:* celebrated corps in the French army, constituted 'Gardes' by royal decree 1616. They comprised more than 2,000 men, were always unswerving in their fidelity to the Bourbon kings, and are remarkable chiefly for their heroic end. 1792, Aug. 10, they withstood the Parisian revolutionary mob, and defended the palace of the Louvre till almost every man was cut down. During the resistance that they offered, the royal family were enabled to escape to such shelter as the National Assembly afforded.

GARDE-VISURE, *gârd-vē-zôr:* heraldic term used for what is commonly called the visor, or front part of the helmet, for the defense of the face and eyes.

GARDINER, *gârd'nėr:* city of Kennebec co., Me.; on the Kennebec river, and on the Maine Central railroad: 7 m. s. of Augusta, 56 m. n.n.e. of Portland. Gardiner has admirable water-power derived from the Cobbossee river, which flows through it and has 8 dams within a m. of its mouth on the Kennebec river, giving a total fall of 135 ft. above low tide. Accordingly it has valuable manufacturing interests, including saw-mills, paper-mills, potteries, and furniture, carriage, woolens, boot and shoe, and sash, blind, and door factories. It is lighted by electricity, has numerous churches, banks, city

hall, high school, public library and costly water-works, and does a large business in lumber and ice. Pop. (1910) 5,311. (See GARDINER, SYLVESTER).

GARDINER, *gârd'nėr*, JAMES: colonel in the British army: 1688, Jan. 11–1745, Sep. 21; b. Carriden, in Linlithgowshire; son of Capt. Patrick Gardiner. At the age of 14 he obtained a commission in a Scots regiment in the Dutch service. He afterward entered the English army, and was severely wounded at the battle of Ramilies 1706. Gardiner fought with great distinction in all the other battles of Marlborough. 1714–5, he was made capt. lieut. in a regt. of dragoons. Some time afterward he gave conspicuous proof of courage, when, with 11 other daring fellows (eight of whom were killed), he fired the barricades of the Highlanders at Preston. From an early period, Gardiner was noted for his licentiousness, which was so marked, that ordinary officers, making no pretensions to religion, rather shunned his society, for fear of being corrupted; yet his strong constitution contributing to his continual gayety and good health, he was known as 'the happy rake.' But in 1719, he suddenly became the subject of profound religious impressions. The circumstances, as narrated by Dr. Doddridge (who had them from Gardiner himself), contain much that is marvellous. Doddridge himself is hardly satisfied with Gardiner's account, and hints at the possibility of the whole being a dream, instead of a 'visible representation of the Lord Jesus Christ upon the Cross, surrounded on all sides with a glory,' etc. He also mentions that Gardiner 'did not seem very confident' whether the voice which came to him was really 'an audible voice, or only a strong impression on his mind equally striking.' Considerable doubt has recently been cast on the whole story by the publication of the *Autobiography of Dr. Alexander Carlyle*, edited by John Hill Burton (Edin. Blackwood and Sons, 1860), in which Carlyle denies altogether the truth of Doddridge's version of the story, at least of the supernatural portion of it. The circumstances, however, are of little moment one way or another; the great fact is the conversion of the brave but wicked soldier into a most devout, exemplary, and faithful Christian, and regarding this there has never been any doubt. In 1724, Gardiner was raised to the rank of major, and 1726 he married Lady Frances Erskine, daughter of the fourth Earl of Buchan, by whom he had 13 children, only five of whom survived him. In 1730 he became lieut.col. of dragoons, and in 1743 col. of a new regt. of dragoons. He was killed at the battle of Prestonpans. The *Life of Colonel Gardiner* was written by Dr. Doddridge.

GARD'INER, JOHN: lawyer, 1731–1793, Oct. 15; b. Boston; son of Sylvester Gardiner, M.D. He studied law and was admitted to practice in London, pursued his profession in England and Wales, was junior council for John Wilkes 1764, was appointed attorney-gen. of St.

Christopher, W. I. 1766, returned to Boston 1783, served in the Mass. legislature 1789-93, and secured the abolition of the law of primogeniture in Mass.; the prohibition of special pleading, and, after protracted labor, the repeal of the anti-theatrical laws. He was an active promoter of the movement which resulted in changing King's Chapel from an Episcopal to a Unitarian church, was an ardent republican and a man of great learning and eloquence.

GARDINER, Samuel Rawson, English historian: b. Ropley, Hampshire, 1829, March 4; d. Sevenoakes, Kent, 1902, Feb. 23. He was educated at Christ Church, Oxford, studied also at Edinburgh and Göttingen; was professor of history at King's College, London, in 1871–85, historical lecturer for the University Extension Society in 1880–94, and examiner in the Oxford final history school in 1886–9. He was elected to a research fellowship by All Souls, Oxford, in 1882, and to a similar fellowship by Merton in 1894. On Froude's death (1894) he declined appointment to the Oxford regius professorship of modern history. It is for his work of research in the history of England from 1603 to 1660 that he is best known. The results were published in instalments later assembled in various collective editions. In the course of his investigations he examined minutest details with extraordinary care. He inspected the scene of most battles which he described; he thoroughly familiarized himself with the state papers of the Record Office, and, for the study of the state papers foreign and the contents of other national archives, learned six continental languages. It is stated that he was the only one that ever read the entire collection of Thomasson tracts in the British Museum. Though himself a Liberal in politics, his writing was wholly judicial and impartial. Perhaps no other English historian ever labored more enthusiastically for historical truth. His style is clear and well ordered, and in later volumes vigorous and often impressive. He was the first to describe in full the period of Commonwealth and Protectorate from an unprejudiced viewpoint, and he was also the first satisfactorily to explain the beginnings of the Cavalier party and the rise of the civil war. He was fortunately enabled to utilize many newly discovered sources. His work was not at first popular, but its worth was later fully recognized. In 1882 he received a civil list pension of £150. The titles of the larger divisions of his great undertaking are: *History of England from the Accession of James I. to the Disgrace of Chief Justice Coke* (1863); *History of England from the Accession of James I. to the Outbreak of the Great Civil War* (1883–4); *History of the Great Civil War* (1886–91); and *History of the Commonwealth and Protectorate* (1894–1901), in three volumes, a fourth to be completed by Firth. He wrote also *Cromwell's Place in History* (1897); *Oliver Cromwell* (1899); and other works, including *The Thirty-Years' War* (1874); *The First Two Stuarts*

and the Puritan Revolution (1876) *Introduction to the Study of English History* (with Mullinger, 1881); *Constitutional Documents of the Puritan Revolution* (1889); *Students' History of England* (1890–2); *School Atlas of English History* (1891); *What Gunpowder Plot Was* (1897).

GARDINER, STEPHEN: English prelate and statesman: 1483–1555, Nov. 12; b. Bury St. Edmunds, Suffolk; illegitimate son of Dr. Lionel Woodville, Bishop of Salisbury, and brother of Elizabeth Grey, queen of Edward IV. He studied at Trinity Hall, Cambridge, and 1520 became master of his Hall. Soon, through the patronage of the Duke of Norfolk, he was introduced to Cardinal Wolsey, who made him his secretary. In this capacity he acquired the favor of Henry VIII., and from his knowledge of the civil and canon law, was sent to Rome 1527, to conduct the negotiation with the pope for the king's divorce from Catharine of Aragon. He was then usually called Dr. Stephens. His exertions were unsuccessful; but having rendered services at the papal court to the Bishop of Norwich, he was by him afterward appointed Archdeacon of Norfolk, while he promoted Wolsey's interests as a candidate for the pontificate. On his return, he was made sec. of state, and in the spring of 1531 was advanced to the archdeaconry of Leicester. In Nov. of the same year, he was installed Bishop of Winchester. Notwithstanding his allegiance to the pope, he warmly supported the king's supremacy, and wrote a treatise in defense of it, entitled *De Vera Obedientia*. He was sent on embassies to France and Germany, and invariably opposed all measures tending to a religious reformation in England. He had a principal hand in the downfall and death by execution of Thomas Cromwell, 1540, and he drew up an impeachment of heresy against Henry's last queen, Catharine Parr; but in a personal interview with Henry she re-established herself in the king's favor, and Gardiner fell into disgrace. At the accession of Edward VI., 1547, Jan. 28, for refusing to comply with the Reformed doctrines, he was committed to the Fleet prison, but released in the following December. In 1548, he was again seized, and committed to the Tower, and on his refusal to sign certain articles submitted to him, was deprived of his bishopric. When Mary ascended the throne 1553, he was set at liberty, restored to his see, and appointed lord chancellor and first minister of state. He took the lead in all the bitter persecutions of the Protestants during Mary's reign, and is charged with great caprice and extreme cruelty; but Dr. Maitland shows that many of the statements regarding Gardiner are gross misrepresentations; and Roger Ascham freely confesses that Gardiner interposed to protect him when summoned by the council on a charge of heterodoxy. The management of the queen's marriage with Philip of Spain was intrusted to him, and he officiated at their nuptials. A treatise, *Necessary Doctrine of a Christian Man*, 1543, is said to have been the joint production of Gardiner and Cranmer. Gardiner's character has been the subject of much criti-

cism. Doubtless he was a zealous, though not a spiritually-minded, ecclesiastic. His devotion was that of an out-and-out *partisan;* but it was nevertheless real after its fashion, for Gardiner would have given his life to advance the cause which had commanded his sympathies and his support.

GARDINER, Sylvester, M.D.: 1707–1786, Aug. 8: b. Kingston, R. I.: philanthropist. He received his medical education in London and Paris, and settling in Boston, practiced, taught materia medica and anatomy, and became wealthy as a drug merchant. He was one of the owners of the Plymouth Purchase on the Kennebec river, founded the city of Gardiner, Me., 1760, colonized it with Germans, built and endowed an Episc. church and a valuable library for it, compiled and published a prayer-book, and was a founder of King's Chapel in Boston. In 1775 he became a royalist, left Boston after the British evacuation 1776, lived in England during the war, and had some 100,000 acres of his property confiscated under the colonial prescription and banishment act. He returned to America 1785, and passed the remainder of his life in Newport, Rhode Island.

GARD'INER'S ISL'AND: island belonging to Easthampton, Suffolk co. N. Y., off the e. end of Long Island, separated from the mainland by Gardiner's bay; area 3,300 acres. It has a light-house at the n. end, containing a fixed light 29 ft. above high water. It was bought from the Indians by Lion Gardiner, English military engineer, 1639, was the first English settlement within the present limits of N. Y., was erected into a lordship and manor for Gardiner by Gov. Dougan, and constituted an independent 'plantation,' and has remained in the possession of the same family; was the scene of the burial of some of Capt. Kidd's treasure 1699, which was subsequently recovered. The British used the island as a supply station during the wars of the revolution, and 1812–15, and a Cuban fillibustering expedition was broken up there by the U. S. authorities 1869.

GARD'NER: thriving town of Worcester co., Mass.: on two branches of the Fitchburg div. of the Boston & Maine R. R.; 15 m. w. of Fitchburg, 26 m. n.n.w. of Worcester, 70 m. w.n.w. of Boston. It contains national banks, high school, weekly newspaper, and cane and willow seat chair factories, which employ 3,000 hands, make over 200 varieties of chairs, and yield an annual product of over $2,000,000. Pop. (1910) 14,699.

GARDNER, Elizabeth Jane, American artist: b. Exeter, N. H., 1842. She was a pupil at Paris of Bouguereau, Merle, and J. J. Lefebvre, and has exhibited much in the United States and foreign countries. Among her works are several portraits: *Cinderella; Fortune-Teller; Moses in the Bulrushes.*

GARDNER, Ernest Arthur, English archæologist: b. London 1862. He was educated at Cambridge Univ., and

was director of the British School of Archæology at Athens, 1887–95. From 1884 he has been engaged in archæological researches in Athens, Paphos in Cyprus, Megalopolis, and elsewhere, and has lectured and written much upon Greek art and archæology.

GARDNER, Eugene C., American architect: b. Ashfield, Mass., 1836, March 28. He was principal of the Academy at Tallmadge, Ohio, 1852–62. He then removed to Northampton, Mass., where he resided 1863–8, engaged in architectural work, going to Springfield, Mass., in the latter year, editing *The Builder* 1885–7, and writing for the *Springfield Republican.* In 1901 he was elected a member of the Massachusetts House of Representatives. Among his works are: *Homes and How to Make Them; Illustrated Homes; Home Interiors; The House that Jill Built; Town and Country School Houses;* and *Common Sense in Church Building.*

GARDNER, George Clinton, American engineer and railway official: b. Washington 1834; d. Richmond Hill, L. I., 1904, Aug. 12. He studied at Columbia for a time, in 1850 became connected with the survey establishing the United States and Mexican boundary from the Gulf of Mexico to the Pacific. In 1856 he was commissioned by the government assistant astronomer and surveyor of the Northwest boundary, and in this survey, for establishing and marking the 49th parallel, he gained considerable distinction. His determinations along this line form the initial points of the United States land surveys. He resigned in 1869 and subsequently was prominently identified with various railway interests. He was general manager of the Mexican National Construction Company, the Mexican National Railroad Company, and the Texas-Mexican Railroad Company, constructing much of these lines, and was connected also with other railways.

GARD'NER, John Lane: 1793, Aug. 1—1869, Feb. 19; b. Boston: soldier. He was appointed 3d lieut. of U.S. inf. 1812, served in Canada during the war with England, was wounded, and after the war transferred to the artillery. He was brevetted maj. 1833, served with the 4th U.S. artil in the Fla. war, was promoted maj. 1845, Oct., served through the Mexican war and was brevetted lieut. col. for gallantry at Cerro Gordo, and col. for his part in the attack on Contreras. He commanded the Fla. dist. 1849–50, was promoted lieut.col. 1852, and was in command of Charleston harbor 1860. He secretly prepared to hold Fort Moultrie against any secession movement, but was removed by Sec. Floyd, and ordered to Tex. He was promoted col. 1861, July 23, retired 1862, employed on recruiting service, reappointed to command Charleston harbor after the war, and brevetted brig.gen. for long and faithful service 1865.

GARDNER, Percy, English archæologist: b. Hackney, Middlesex, 1846, Nov. 24. He was educated at Cambridge Univ., was Disney professor of archæology there in

1880, and has been professor of classical archæology at Oxford from 1887. Among his publications are: *Samos and Samian Coins* (1882); *The Types of Greek Coins* (1883); *New Chapters in Greek History* (1892); *Manual of Greek Antiquities* with Jevons (1895); *Sculptured Tombs of Hellas* (1896); *Exploratio Evangelica* (1899); *Historic View of the New Testament* (1901); *Grammar of Greek Art* (1903).

GAREE, Gari, or Gharry, n. *gār'ē:* often pronounced *găr'rĭ* [Skr.]: in *India*, any wheeled conveyance, such as a barouche, phaeton, or a railway carriage.

GARE-FOWL: see Auk.

GARFIELD, *gâr'fēld*, James Abram: 20th president of the United States 1831, Nov. 19—1881, Sep. 19; b. Orange, Cuyahoga co., Ohio. He attended the district school, worked on the frontier farm, drove a boat-horse on the Ohio canal, attended the Geauga Seminary at Chester, Ohio, 1849–50, entered the present Hiram College in Portage co., Ohio, a 'Campbellite' (properly, Disciples) institution 1851, taught there while studying, entered Williams College, Mass., 1854, and graduated with the brightest honors of his class 1856. Returning to Ohio he resumed teaching in Hiram College, became its pres. 1857, began studying law while teaching and preaching 1858, was admitted to the bar and elected state senator 1859. In 1861, Aug., he was appointed by Gov. Dennison lieut. col. of the 42d Ohio vols., composed largely of his former pupils. Soon afterward he was elected col., and in Dec. he reported to Gen. Buell, at Louisville, Ky., for duty. He was given command of a brigade and charged with the expulsion of the Confederates under Gen. Marshall from e. Ky. In 1862, Jan., he accomplished the task, for which he was promoted brig.gen. of vols., and assigned to command the 20th brigade of Buell's army. He took part in the second day's fight at Shiloh, in the operations before Corinth, and rebuilt the bridges of the Memphis and Charleston railroads and repaired the fortifications at Huntsville. In 1862, Nov., he was appointed a member of the court that tried Gen. Fitz John Porter; 1863, Feb., was made chief of staff to Gen. Rosecrans, commander of the army of the Cumberland, Sep. 19 was promoted maj.gen. of vols. for gallantry on the unfortunate field of Chickamauga, and Dec. 5, resigned his commission at President Lincoln's request to take the seat in congress to which he had been elected more than a year previously. His high military record led to his appointment as member of the committee on military affairs, and in his second congressional term he became its chairman. While special importance was attached to his military opinions and judgment, the house and the country soon came to recognize in him a man of more than ordinary information, a scholar, a linguist, a hard student, and an effective debater. In 1865 he was placed on the committee of ways and means, disliking service on the military committee after the war was over, but was restored to the chairman-

ship of the military committee 1867. He vigorously opposed President Johnson's reconstruction policy, made his first speech on general finances and the national debt 1866, March, foreshadowing the specie resumption of later years, became chairman of the new committee on banking and currency on its creation, and served on the committees on the census rules, appropriations (chairman), and, under the democratic organization of the house, the ways and means again. After the presidential canvass 1872, he, with the vice-pres., the vice-pres. elect, the sec. of the treasury, speaker of the house, and several senators and representatives, was charged with having accepted Credit Mobilier (q.v.) stock at a low rate for improper purposes. Committees of investigation were appointed in both houses of congress 1872, Dec., and reported 1873, Feb., in favor of expelling certain members and censuring others. Garfield was charged with having bought $1,000 worth of the stock and with receiving a dividend on it of $329, but he denied having ever owned such stock and declared the money received from Oakes Ames was a loan of $300, which he had repaid. The same congress, investigating the affairs of the govt. of the D. C., connected his name with the notorious De Golyer paving contract. He was charged with having accepted a bribe of $5,000 to influence his vote in favor of a bill of the board of public works to pave Washington with the De Golyer wood pavement. His defense and the finding of the investigating committee were that he had been paid that amount as a legal fee for preparing a brief showing the superiority of the pavement over 40 other kinds, and that whatever there was of fraud in the paving business was due to the terms of the contract, not to the patent. In 1876, at the request of President Grant, he was one of a delegation of republicans who went to New Orleans to oversee the counting of the La. presidential vote, and reported on the West Feliciana parish case. He opposed the appointment of the electorial commission and delivered a strong speech on the duty of congress in a presidential election, holding that the vice-pres. had a constitutional right to count the electoral vote. On the passage of the bill authorizing the commission he and George F. Hoar, of Mass. were chosen the two republican members, and 1877, Feb. 9, 16, he discussed the Fla. and La. returns before it. During that year he became the republican candidate for speaker of the house, and on the advancement of James G. Blaine to the senate, was regarded as the leader of his party in the lower house. After a continuous service in the house of representatives of 17 years, he was elected U.S. senator, 1880, Jan. 13. In June the memorable 'third term' contest occurred in the national republican convention, when the admirers of Gen. Grant determined to give him the presidential nomination for a third term. In that body Garfield headed the Ohio delegation, and not only was an open champion of John Sherman, but put him in

JAMES A. GARFIELD.
Twentieth President of the United States.

nomination. For 33 ballots Gen. Grant received a vote that only varied between 303 and 313, a result due almost exclusively to the friendship and great tact of Roscoe Conkling. On the 34th ballot Wis. cast 36 votes for Garfield to the surprise of the whole convention: on the 35th he gained largely; and on the 36th there was a general break, and he received 399 votes, a majority. He was unanimously nominated June 8, with Chester A. Arthur, of N. Y., for vice-pres. In the election Nov. 2, the republican candidates received 4,449,053 popular and 214 electoral votes, and the democratic candidates, Gen. Winfield S. Hancock and William H. English, 4,442,035 popular and 155 electoral votes. Shortly after his inauguration he gave offense to Senators Conkling (q.v.) and Platt, of N. Y., by his nominations of U. S. officials in N. Y., and May 16 both senators resigned. July 2, in the waiting room of the Baltimore and Potomac railroad in Washington as be was about joining his wife on a New England pleasure trip, he was twice shot by Charles J. Guiteau, a disappointed and mentally unbalanced office-seeker. He was at once conveyed to the White House and there attended by the highest medical skill till Sep. 6, when he was removed to the seashore at Elberon, N. J. Blood-poisoning appeared on the 15th, and four days later he died. Funeral services were held in Washington Sep. 23, and Cleveland 26th, and on 1882, Feb. 27, his friend and sec. of state, James G. Blaine, delivered a memorial oration at the request of both houses of congress in the hall of the house of representatives. The remains were guarded by a military force, in a temporary vault in Lake View cemetery, Cleveland, pending the erection of an imposing monument. A bronze statue of him was unveiled in Washington, 1887, May 12, and over $360,000 was raised by popular subscription for his widow and children. His assassin was promptly arrested, indicted, and after one of the most sensational trials on record, convicted, and executed 1882, June 30. Garfield had brilliant intellect fine scholarship, and a warm and genial nature which made him a popular favorite. He was a member of the 'Disciples' Church, and sometimes preached in its pulpits.

GARFIELD, James Rudolph, son of the preceding: lawyer and government official; b. 1865, Oct. 17, at Hiram, Ohio. Receiving a preparatory course at St. Paul's School, Concord, N. H., he entered Williams College and was graduated thence in 1885. He then took a course in the Law School of Columbia College, and being admitted to the bar in 1888, commenced practice in Cleveland, Ohio. He subsequently became a member of the U. S. Civil Service Commission, and in Feb. 1903, was appointed Commissioner of Corporations in the national Department of Commerce and Labor. In this capacity he made a report to Congress, 1904, Dec. 21, which aroused widespread interest by its exposures of

unjust and irregular commercial conditions, the inefficiency of the laws relating to corporations, and the anomalous character of interstate commerce. But the centralizing character of the reform measures which he proposed met with strenuous opposition, although subsequent legislation by Congress along this line was largely due to the revelations which he had made. In 1907 he became secretary of the interior.

GARFISH, n. *gär'fĭsh* [AS. *gar,* a spear]. (*Belone*): genus of the family *Scomberesocidæ,* having very long bodies with minute scales and green bones. The flesh is wholesome. The Common Garfish (*B. vulgaris*) is sometimes called Greenbone, Gorebill, and Mackerel-guide, receiving the last name because it visits the coasts just before the mackerel. It is usually about two ft. in length; the tail is forked; the pectoral and ventral fins are small; the upper part of the head and back is of a dark greenish blue; the cheeks and gill-covers, the sides and the belly, are silvery white. The Garfish is a very lively fish; it swims near the surface of the water, and frequently springs out of it. The flesh has a flavor somewhat like that of mackerel. Some species of Garfish attain large size. Other species are fresh-water fishes of warm climates as India and Guiana.

GARGANEY, *gär'ga-nĭ* (*Anas querquedula,* or *Querquedula circia*): species of duck or teal, considerably larger than the common teal, though not so large as the wild duck, not even as the widgeon; a rare British bird, more common in s. Europe, found also in n. Africa, and in Asia, at least as far e. as Calcutta. The male Garganey is a beautiful bird; the prevailing color dark brown, finely varied on the cheeks and neck, with short hair-like lines of white; the speculum grayish-green, margined with white; a conspicuous white streak over each eye extending to the neck. The female is smaller than the male, the colors more dull, and the white streak obscure. The Garganey, is much esteemed for the table.

GAR'GARA, or Gar'garus. See Ida.

GARGET, n. *gär'gĕt* [unascertained]: inflammation or distemper in cattle. Gargol, n. *gär'gŏl,* a distemper in hogs.

GAR'GET-ROOT. See Poke; Phytolacca.

GARGLE, n. *gär'gl,* or Gargarism, *gär'gär-izm* [imitative of the sound produced: F. *gargouiller,* to gargle: comp. Gael. *garg,* rough; Gr. *gargarĕōn,* the throat]: various liquid medicinal preparations intended to be churned about in the mouth and throat, with a view of cleansing the parts when affected with discharges from ulcers; or of acting as astringents (q.v.), or stimulants (q.v.,) in relaxed sore throat. The best gargles are composed of vinegar or hydrochloric acid largely diluted; of chlorine water or Condy's disinfecting liquor, in putrescent cases; of port-wine, alum, and capsicum (cayenne pepper), when a stimulating effect is required; of tannin or oak-bark

decoction with alum or borax in case a pure astringent is needed. Gargles are very useful in the later stages of almost all varieties of sore throat. GARGLE, v. to wash the mouth and throat by keeping the liquid in play in the back part of the throat by expirations of air from the lungs. GAR'GLING, imp. *-glĭng.* GARGLED, pp. *-gâr'gld.*

GARGOYLE, n. *gâr'goyl,* or GURGOYLE, n. *gėr'goyl* [F. *gargouille,* the throat, a spout to void the rain-water of a house: comp. Gael. *gearr,* to cut; *goill,* a face distorted]: projecting spout, leading the rain-water from the roof-gutters of buildings. Gargoyles of various forms have been used in almost all styles of architecture, but were peculiarly developed in Gothic architecture. In some of the larger mediæval buildings, where the height of the walls is considerable, the gargoyles have to project very far, in order to serve their purpose, and are in such cases of large size. The gargoyles of French buildings have usually great prominence, much more than in England. Some gargoyles are small and plain, others large and ornamental, according to their various positions. They are carved into all conceivable forms—angelic, human, and of the lower orders; are often of antic or impish suggestion; and as in fountains, the water is generally spouted through the mouth. In late castellated buildings, they frequently assume the form of small cannons projecting from the parapet. In modern times they have been almost entirely superseded by leaden pipes.

GARHWAL. See GURHWAL.

GARIBALDI, n. *găr-ĭ-băl'dĭ:* a kind of waist worn by ladies, and so called from its resemblance to the red shirt worn by Garibaldi and his men; also a hat so named for its similarity to their hats.

GARIBALDI, *găr-ĭ-băl'dĭ,* It. *gâ-rē-bâl'dē,* GIUSEPPE: 1807, July 4—1882, June 2; b. Nice, Italy; of respectable parents. His father, the owner of a trading-vessel, having been engaged all his life in maritime pursuits, young Garibaldi soon acquired a predilection for the hazards of a seafaring life. With the permission of his father, he adopted the profession of a sailor, and made his first voyage to Odessa under the command of an able and experienced seaman, Captain Pesante. He subsequently visited Rome, Cagliari, Vado, Genoa, etc., with various commanders, and soon became a skilful and fearless mariner, distinguished by his prompt decision in action and imperturbable presence of mind. In 1830, he was himself in command of the brig *Notre Dame de Grâce;* and about this time his sentiments of patriotism seem to have gained intensity by his intercourse with a fervid Italian patriot, a casual passenger on his vessel. From 1833, his acquaintance with Mazzini and the leaders of the Italian liberal movement dates, and from that period his unquenchable hatred of despotism, and devotion to the service of universal freedom, exercised a predominant influence on all his actions, and ultimately became the *single*

motive of his career. In 1834, having compromised himself by participating in a futile revolutionary outbreak at Genoa, he was compelled to save his life by flight; and after extreme hardship, succeeding in gaining French territory simultaneously with the publication in Italy of the sentence of his condemnation to death. Garibaldi now resumed his seafaring life, but was soon in S. America fighting for Rio Grande, then in rebellion against Brazil. He was a cattle-dealer at Monte Video when he volunteered to serve Uruguay in its war with Buenos Ayres, but soon showed so remarkable a talent for military leadership, that he was raised to the supreme command both naval and military. In 1848, war having broken out between Austria and the liberals of Italy, Garibaldi hastened to Europe. He bore an effective part in the whole Italian campaign, but distinguished himself especially at Rome by his resistance to the French forces, who during four weeks were successfully kept at bay, and repeatedly repulsed by the republican forces of Rome, under his direction. Rome having at length succumbed to the immensely superior forces at the disposal of Gen. Oudinot, Garibaldi marched forth from the city as the French poured in. After a retreat of unparalleled difficulty through districts densely occupied by Austrian forces, Garibaldi, accompanied by his devoted and heroic Brazilian wife, set sail in a small fishing-craft toward Venice; but being pursued by Austrian vessels, they were compelled to land at random, and not far from the shore his wife, exhausted by the dangers and terrible exertions of their flight, expired in the arms of her husband. Garibaldi at length reached Genoa in safety, and was next heard of as a candlemaker at New York. Subsequently as commander of an American trading vessel, he was welcomed at several English ports. In 1854, he bought half of the rocky island of Caprera, off the Sardinian coast, the rest being afterwards presented to him by friends. Between the war of 1848 and that of 1859, Garibaldi publicly accepted the substitution of monarchy such as existed in Piedmont, for the republican form of government, for which he had originally combated, and was therefore free to serve as an irregular auxiliary of the Piedmontese forces on the commencement of hostilities. His services in that capacity were both brilliant and effective, notwithstanding the limited scope assigned for his operations. In the course of the following year (1860), the most triumphant and momentous enterprise of his marvellous career was accomplished. The chief result of the peace of Villafranca, by which the Italian war of 1859 was brought to an abrupt and unsatisfactory termination, was the immediate resumption by the Italian people of the revolutionary and progressive responsibilities, which during the campaign had been vested by the nation in the govt. of Sardinia. Thus, early in 1860, insurrectionary disturbances broke out in Palermo, and though speedily quelled in the city by the great numerical strength of the Neapolitan gar-

rison, they were constantly repeated throughout the interior of the island, where the insurgents were full of elation and daring, in consequence of Garibaldi having transmitted to them the assurance that he would speedily appear himself to head their struggle. In fulfillment of this promise Garibaldi assembled at Genoa a volunteer force of 1,070 patriots, and set sail May 5 for the island of Sicily. On the 11th, his two small transport steamers having reached Marsala in safety, the landing of his followers was successfully effected in sight, and partially under fire, of the Neapolitan fleet. On the 15th, in the battle of Calatafimi, 3,600 Neapolitan troops were routed by Garibaldi's small force, and to this opening victory may be largely attributed the subsequent success of the entire expedition. It at once cleared the way to Palermo, and inspired Garibaldi's soldiers with irresistible confidence. On the 18th of the same month, Garibaldi and his little army of heroes occupied the heights which command Palermo, and after a desperate conflict with the royalist troops, fought his way into that unhappy city, which for several subsequent days had to sustain a ruthless bombardment from the united fire of the Neapolitan garrison and fleet.

The intervention of the British fleet, seconded by the isolated and destitute condition of the garrison shut up in the forts, induced the Neapolitan general to capitulate: and on his departure with his troops, Garibaldi remained in undisputed possession of the city and strongholds of Palermo. His first public enactment was the universal armament of the citizens. July 20, at the head of 2,500 men, he gave battle at Melazzo to 7,000 Neapolitans, who were completely defeated, and compelled to evacuate the fortress. On the 25th, the Neapolitans were driven back into Messina, where Garibaldi made his triumphal entry on the 27th, the mutinous garrison, terrified at his approach, having compelled their general to submit. Toward the middle of August Garibaldi made a descent in Calabria, and was immediately joined by large bodies of volunteers from all directions, by whom he was accompanied on his memorable and eventful march to Naples. Sep. 5, Garibaldi's army, which then amounted to 25,000 or 30,000 men, occupied Salerno on the withdrawal of the royalists, and on the 7th, amid the frenzied enthusiasm of the inhabitants, Garibaldi entered Naples, with only one or two friends, to prove to Europe that his advent was that of a welcome liberator, and not of a terror-inspiring conqueror. On the previous day, the capital had sullenly witnessed the withdrawal of King Francis II to the fortress of Gaeta. Before the close of the month, Garibaldi had enacted several judicious public reforms, calculated to increase the popularity of the Sardinian govt. of which he was the declared representative, though for a brief space he accepted the title and powers of Dictator. Oct. 1, his military duties became again paramount, as the royalists

troops, numbering, 15,000 men, came forth from Capua, and attacked fiercely the whole line of the Garibaldians, spread along the Volturno. For some hours a terrible suspense reigned, and more than once it seemed as if success were about to desert the patriots at the last moment; but finally the royalists were driven back to Capua in disorder, and Garibaldi announced the result in his famous telegram—'Complete victory along the entire line.' This was Garibaldi's last triumph in that struggle; Victor Emmanuel having re-assumed the command of his army, crossed the papal frontier, routed the troops under Lamoricière, and passed on into the kingdom of Naples, where he was met by Garibaldi, who immediately relinquished into his sovereign's hands the unconditional disposal of the southern volunteer army, and the absolute sway over the Neapolitan provinces.

In the spring of 1864, Garibaldi visited England, and was honored with a banquet by the Lord Mayor and the city of London. His sudden departure led to a good deal of public discussion, and the British govt. was compelled by public opinion to explain why it advised this course. During the campaign of 1866, Garibaldi took the field and was engaged in operations against the Austrians in the Tyrol, where he sustained a severe repulse, which he retrieved next day, and was preparing to advance against the enemy when the war was brought to a close, and he returned to Caprera. 1867 was a disastrous year for Garibaldi. He then openly organized an invasion of the States of the Church, to complete the unification of Italy, but was made prisoner, and afterward allowed to return to Caprera, in the neighborhood of which a man-of-war was stationed to prevent his escape. He did escape, however, only to be speedily defeated by the pontifical, reinforced by French troops. Again Garibaldi retired to his island home, which he left to fight for the French republic 1870. He was nominated to the command of the irregular forces in the Vosges, and performed the best services in the field during the memorable Franco-German war. In 1871 Garibaldi was returned a deputy to the French National Assembly for Paris, but declined to sit, and returned to Caprera. He entered the Italian parliament 1875. After much hesitation, he accepted from the parliament an annual pension of 50,000 lire. He devoted all his energy to the promotion of plans for the regulation of the course of the Tiber and the reclamation of the waste land near Rome. These schemes being pronounced impracticable, Garibaldi withdrew again from public life and settled at home. He had returned to his former Mazzinian republicanism, and sympathized with the *Italia Irredenta* movement. In 1880, the liberator went to Milan to unveil a monument to those who fell at Mentana 1867, in the unsuccessful attempt on Rome; and 1882, March, he went to Palermo to the celebration of the sixth centenary of the Sicilian Vespers. Less than three months afterward he died.

His wish that his body should be cremated was not given effect to. By his first wife Garibaldi left two sons (of whom the elder, MENOTTI GARIBALDI, fought with credit by his father's side) and a daughter; and he had two other children by a peasant woman whom he married late in life. Garibaldi's novels (*Clelia*, 1870; *Cantonio*, 1870; *I. Mille*, 1874) show fervid anti-clericalism, but have no literary value.

GARIEP, *gâr-ēp'*, or ORANGE: river of s. Africa, which, after a westward course of 1,000 m., enters the Atlantic, lat. 28° 30′ s. Its source is about 10,000 ft. above the sea. Through nearly its whole length it forms the n. boundary of the Cape Colony. For navigation, this river is almost useless.

GARIGLIANO, *gâ-rēl-yâ'nō* (*Liris* of the ancients): largest and most important river of s. Italy. It rises in the Abruzzi, and empties into the Mediterranean, in the Gulf of Gaeta. Its sluggish course was noted by the ancient poets. On the banks of the Garigliano was fought a famous battle, 1503, between the French and the Spaniards commanded by Gonsalvo de Cordova, surnamed the Great Captain, in which the French were totally routed.

GARISH. See GAIRISH.

GARLAND, n. *gâr'lănd* [OF. *garlande*, a garland—from mid. L. *garlanda:* Sp. *guirnalda;* F. *guirlande*, a garland —from It. *ghirlanda*, a garland: comp. Gael. *gaire*, joy; *lan*, full]: a wreath or chaplet made of branches, flowers, etc. (see CROWN): a collection of poetical extracts: V. to deck with flowers. GAR'LANDING, imp. GAR'LANDED, pp.

GARLAND, *gâr'land*, AUGUSTUS HILL: lawyer: b. Tipton co., Tenn., 1832, June 11; d. 1899, Jan. 26. He received a collegiate education in Lebanon and Bardstown, Ky., was admitted to the bar in Washington, Ark., 1853, and after practicing there three years settled in Little Rock. He was a Bell and Everett presidential elector in 1860, opposed secession in the Ark. state convention, served in the provisional and both branches of the Confederate congresses, was denied a seat as U. S. senator elect 1867, and the same year received a favorable decision from the U. S. supreme court on his application for the right to practice before it without taking the 'iron clad' oath. In 1874 he was elected gov. of Ark., 1876 and 83 U. S. senator as a democrat, and 1886, Mar. 5, became atty.-gen. of the United States in Pres. Cleveland's cabinet, and served till 1889.

GARLAND, HAMLIN: an American author: b. 1860, Sept. 16; was educated in the common schools of Mitchell co., Ia., and afterward took a course in literary studies; taught school in 1882–83, and a little later settled in Boston where he began his career as a story writer. His works include: *Main Traveled Roads* (1891); *A Spoil of Office; Prairie Folks; Jason Edwards* (1891); *A Member of the Third House* (1892); *Prairie Songs* (1893); *A Little Norsk* (1893); *Crumbling Idols* (1894); *Rose of*

Dutcher's Coolly (1895); *Wayside Courtships* (1897); *The Eagle's Heart* (1901); *Captain of the Gray Horse Troop* (1902); *The Tyranny of the Dark* (1904); etc.

GARLAND, Landon Cabell, American educator: b. Livingston, Va., 1810, March 21; d. 1895. He was graduated at Hampden-Sidney College, Virginia, was professor of chemistry at Washington College in that State 1830–3, at Randolph-Macon College 1833–5, and became president of the latter in 1835. In 1847–53 he was professor of astronomy and mathematics at the Univ. of Alabama, in 1855–66 its president; later was professor of physics in the Univ. of Mississippi, and chancellor of Vanderbilt Univ.

GARLIC, n. *gâr'lĭk* [AS. *garleac:* Icel. *geirlaukr*, garlic —from AS. *gar*, Icel. *geirr*, a spear, and Icel. *laukr*, a leek], (*Allium sativum*, see Allium): a bulbous-rooted plant, a native of the East, cultivated from the earliest ages. The name is given also to the bulb. The stem rises to the height of about two ft., unbranched, and bearing at top an umbel of a few whitish flowers, mixed with many small bulbs. The upper part of the stem before flowering is rolled together into a ring. The leaves are grass-like, obscurely keeled, and not fistulous like those of the onion. Three alternate stamens are 3-pointed, the middle point bearing the anther. The bulb consists of 12—15 ovate-oblong *cloves* or subordinate bulbs, axillary buds of its scales thus developed; it contains a viscid juice sometimes used as a cement for porcelain, and has a penetrating and powerful *alliaceous* odor, which indeed pervades the whole plant, with a pungent aromatic taste. It is in general use in some countries as a condiment with other articles of food, and to many it is in this way very agreeable; to others, it is disgusting. It is much more largely used in other countries than in the United States and Britain; in Spain, it enters into the composition of almost every dish. Garlic, or its fresh juice, is used also in medicine: it is stimulant, tonic, and promotes digestion; it has also diuretic and sudorific properties, and is a good expectorant, promoting all the excretions. Applied externally, it is a rubefacient, and is used to stimulate indolent tumors. A liniment of oil and Garlic juice is sometimes applied to the chest in infantile convulsions. In some cases of deafness, much benefit is obtained from a clove of garlic or a few drops of the juice put into the ear. Garlic is used also as an anthelmintic. It owes its properties chiefly to *oil of garlic* (see below). Garlic abounds also in mucilage.

GAR'LIC, Oil of: substance giving to garlic its distinctive properties. When cloves of garlic are distilled with water, about 0·2 per cent. of a brown heavy oil, with an acrid taste, and a strong disagreeable smell, passes over. By careful rectification from a salt-water bath, about two-thirds of the oil may be obtained in the form of a yellow liquid lighter than water, and which, when treated with chloride of calcium (in order to dry it), and subsequently

distilled from fragments of potassium, comes over pure and colorless as sulphide of allyl, an organic compound of considerable interest, fomula $(C_2H_5)_2S$. The crude oil contains also oxide of allyl $(C_3H_5)_2O$, and a compound of allyl still richer in sulphur than the sulphide.

Sulphide of allyl exists not only in oil of garlic, but also in the oils of onions, leeks, cress, alliaria, radishes, asafetida, etc. It is a light, clear, pale-yellow oil, with a penetrating odor of garlic; it boils at 284°, and dissolves readily in alcohol and ether. Sulphide of allyl may be obtained from essential oil of black mustard (which in its purified form is represented by (C_3H_5,CNS) and may consequently be regarded as sulphocyanide of allyl) by distillation with sulphide of potassium. The reaction is exhibited in the following equation:

Oil of Mustard.		Potassium Sulphide.		Allyl Sulphide.		Potassium Sulphocyanide.
$2(C_3H_5,CNS)$	+	K_2S	=	$(C_3H_5)_2S$	+	$2KCNS.$

We may perform the converse experiment, and obtain oil of mustard from oil of garlic by mixing alcoholic solutions of sulphide of allyl and corrosive sublimate, when a white precipitate is formed represented by $(C_3H_5)_2S,2HgS + C_3H_5Cl,HgCl_2$ and distilling this compound with sulphocyanide of potassium; in which case oil of mustard will be found among the products.—The pungency of horse-radish, scurvy-grass, and allied plants, is due to the presence of this essential oil of mustard or sulphocyanide of allyl. See MUSTARD, OIL OF.

GARMAN, HARRISON, American naturalist: b. Lena, Ill. 1858, Dec. 27. He was graduated at the State Normal University and studied later at Johns Hopkins University. He has held many professional positions, among them being entomologist and those of professor of zoology and entomology at Kentucky State College, 1892–6, and State entomologist of Kentucky since 1897.

GARMAN, SAMUEL, American naturalist: b. Indiana County, Pa., 1846, June 5. He was graduated at the Illinois State Normal University in 1870, and became assistant in herpetology and ichthyology in the Museum of Comparative Zoology, Cambridge, Mass., in 1873. His works include: *The Reptiles and Batrachians of North America; Chlamydóselachus; The Evolution of the Rattlesnake;* etc.

GARMENT, n. *gâr′mĕnt* [It. *guarnimento;* F. *garniment,* decking or trimming: F. *garnir,* to deck, to adorn]: any article of clothing. GAR′MENTS, n. plu. dress in general.—SYN. of 'garment': dress; attire; apparel; habit; costume; clothes; clothing; vesture; vestment; raiment; coat; gown.

GARNER, n. *gâr′nėr* [OF. *gernier;* F. *grenier,* a corn-loft—from *grene,* grain—from L. *granārĭŭm,* a granary]: a place where grain is stored; a granary: V. to store in a granary. GAR′NERING, imp. GAR′NERED, pp. *-nėrd.*

GARNER CASE, 1856, the most tragic of the fugitive-slave cases. Simon Garner, his wife, and his son Robert, slaves of John Marshall of Kentucky, and Robert's wife Margaret and their four children, slaves of A. R. Gaines, ran away, crossed the Ohio on the ice, and took refuge with a Cincinnati colored man. Gaines tracked them, secured a warrant, and with a deputy marshal and a band of assistants attacked the house. After a desperate fight the fugitives were overpowered, one of the posse being badly wounded; but Margaret, who had shared in the conflict, found time before her capture to murder one of the children, severely cut the throats of two others, and considerably bruised the baby, to keep them from returning to slavery. In sympathy with them, and to establish their freedom as denizens of Ohio, a Cincinnati judge issued a writ of habeas corpus, and the grand jury indicted Margaret for the murder of her child, and her husband and his father as accessories. The United States fugitive-slave law of 1850 prevailed, however; the slaves were given back to their owners and sent down the river. On the voyage Margaret jumped overboard with the baby; she was rescued, but the child was lost, at which she expressed satisfaction.

GARNET, n. *gär'nĕt* [It. *granato*, the pomegranate, fine scarlet; *granata*, a garnet or precious stone—from mid. L. *grānātŭs*, having many grains or seeds, in mid. L. a garnet: OF. *grenat* or *granat*]: a precious stone, some of the varieties of which are of great beauty; while some are less highly prized than other not more beautiful minerals, because much more common. Garnets are found most frequently in mico-slate, hornblende slate, and gneiss; less frequently in granite and granular limestone; sometimes in serpentine and lava. There are numerous varieties, differing considerably in chemical composition; anhydrous silicates of alumina and lime or magnesia, colored with oxide of iron, of manganese, or of chrome. The color is various, generally some shade of red, brown, black, green, or yellow. Colorless and white specimens also occur. Red garnets sometimes contain so much iron as to be attracted by the magnet. The coarser variety of garnet, known as Common Garnet, is generally found massive, often forming a considerable part of the rock in which it occurs, so as even to be used as a flux in the smelting of iron. Crystallized garnets also are often very numerous in the rock which contains them; the crystals sometimes very small, almost imperceptible grains; sometimes are large as a man's fist. The primary form of the crystal is a cube, but the common secondary forms are a rhombic dodecahedron, and an acute double eight-sided pyramid, the summits of which are abruptly acuminated by four planes. —Noble Garnet, or Precious Garnet, also called *Almandine*, is generally of crimson-red color, sometimes of so deep a tint, that jewellers hollow it out beneath, or place at the back of it a plate of silver. It is sometimes

transparent, sometimes only translucent. It is found in some mountainous parts of England and Scotland, of the United States, and other countries, but the finest garnets are imported from Syriam, in Pegu. A Syriam garnet, of a velvety black color, without defect, is valued at about half the price of a blue sapphire of the same weight. The large specimens of the precious garnet are generally engraved with figures, and thus acquire very high value.—A variety of garnet known as *Grossularia*, from its resemblance in form, size, and color, to a green gooseberry, is brought from Siberia.—Cinnamon Stone (q.v.) is a variety of garnet. Pyrope, Vesuvian, and Epidote are nearly allied to it. Powdered garnets are often used for polishing and cutting other stones; this powder is known to lapidaries as *Red Emery*.

GAR'NETT, James Mercer, American philologist: b. Aldie, Va., 1840, April 24. He was graduated at the University of Virginia in 1859; served in the Confederate army during the Civil War; and was professor of English language and literature in the University of Virginia 1882–96. He is the author of: *Translation of Beowulf; Elene and Other Ango-Saxon Poems; History of the University of Virginia.*

GARNETT, Richard, English poet and librarian: b. Lichfield, Staffordshire, 1835, Feb. 27; d. London, 1906, April 13. He was appointed in 1851 assistant in the printed book department of the British Museum, became superintendent of the reading-room in 1875, but resigned in 1884 to devote himself more exclusively to the printing of the 'Museum Catalogue,' of which he had charge from its commencement. He published: *Primula: a Book of Lyrics* (1858); *Egypt and Other Poems* (1859); *Poems from the German* (1862); *Relics of Shelley* (1862); *Idylls and Epigrams* (1869); *Selections of Shelley's Poems* (1880); *Letters* (1882); *Life of Carlyle* (1887); *Life of Emerson* (1887); *Twilight of the Gods* (1888); *Life of Milton* (1890); *Iphigenia in Delphi* (1891); *Poems* (1893); *William Blake: Painter and Poet* (1895); *The Age of Dryden* (1895); *One Hundred and Twenty-four Sonnets from Dante, Petrarch and Camoens* (1896); *Richmond on the Thames* (1896); *Life of Edward Gibson Wakefield* (1898); *History of Italian Literature* (1898); *Essays in Librarianship and Bibliography* (1899); *The Queen and Other Poems* (1901); *Essays of an Ex-Librarian* (1901); etc. He also contributed extensively to the magazines and cyclopædias. He resigned from the Museum in 1899.

GARNETT, Robert Selden, American soldier: b. Essex County, Va., 1819, Dec. 16; d. Carrick's Ford, Va., 1861, July 13. Graduated from the United States Military Academy in 1841 and made brevet 2d lieutenant of artillery, he served on the northern frontier during the Canadian border disturbances, and distinguished himself in the war with Mexico (1846–8), receiving the brevet of major for his conduct at Buena Vista. He was transferred to

the Seventh infantry in 1848, fought in Florida against the Seminoles, and was commandant at West Point in 1852–4. In 1855 he was promoted major of infantry, and in 1856 commanded the expedition against the Indians of Puget Sound. At the outbreak of the Rebellion in 1861 he resigned his commission, and was made adjutant-general, with colonel's rank, to organize the Virginia forces. Shortly afterward he was appointed brigadier-general, C. S. A., and given command of the troops in the western part of Virginia. While endeavoring to retreat to Beverly, he was overtaken by the Federals at Carrick's Ford, Cheat River, and took command of a detachment with which he sought to cover the retreat. His force was routed, and he was killed during the combat.

GARNETT, Kan., city and county-seat of Anderson County, on the Pottawattomie River, and on the Missouri P. and the Atchison, T. & S. F. R.R.'s, 45 miles northwest of Fort Scott. It has good educational institutions, including a United Presbyterian college. There are large manufactures of furniture, and also of cheese. Pop. (1900) 2,078.

GARNIER, *gâr-ne-ā'*, Jean Louis Charles: French architect: b. Paris, 1825, Nov. 6; d. 1898, Aug. 4. He studied sculpture and alto-relievo at the special school of design where he took several prizes, attended the school of fine arts 1842–48, and took the great prize with his design for a *Conservatoire pour les arts et métiers* 1848, continued his studies in Italy and Greece, and returned to France 1854. He exhibited a polychromatic design for the restoration of the temple of Jupiter at Ægina at the exposition 1855, and works in watercolor at the Salons 1857, 59, 63, obtained a 3d class medal 1857, a 1st class 1863, and was decorated with the cross of the Legion of Honor 1864 and as an officer 1875. His plans for the new grand opera-house in Paris were unanimously adopted 1861, and he was given the supervision of construction and decoration which cost $9,900,000. Owing to the Franco-German war the building was not completed till 1875. In 1877 he was appointed inspector-gen. of civil constructions; 1876, Jan., San Carlos Theatre, Monaco, designed by him, was opened, and 1886 he was voted the gold medal of the Institute of British Architects.

GARNIER, Marie Joseph François, usually called Francis G.: 1839, July 25—1873, Dec. 21; b. St. Etienne, France: explorer. He served several years in the French navy, became an officer on the staff of Admiral Charner, was on duty in Cochin-China 1860–62, and in the latter year was appointed inspector of the natives in that province, and administrator of the town of Cho-len. He suggested the advantage of sending a French mission through Laos to Tibet, and being considered too young to command such a party the chief authority was given to Capt. Doudart de Lagrée, while Garnier was intrusted with important though subordinate duties. The expedition

traversed 5,392 m. between Cratieh in Cambodia and Shangai, of which 3,625 m., chiefly of country unknown to European geography, were surveyed by Granier, who also fixed important positions by astronomical observations. He successfully conducted a detachment to Talifu, cap. of Suleiman, sultan of the Mahometan rebels in Yunnan, assumed command of the mission on the death of Lagrée, and conducted it safely to the Chinese coast. In 1870 he was presented with the Victoria medal of the Royal Geographical Soc. of London, during the Franco-German war held a naval staff office, 1872 returned to Cochin-China, 1873 was commissioned to form a French colony in Tonquin, Nov. 20 took Hanoi, the cap. of Tonquin, and Dec. 7 was killed by the natives.

GARNIER-PAGES, *gâr-ne-ā′ pâ-zhās′*, Louis Antoine: 1803, July 18—1878, Nov. 1; b. Marseilles: author. He was engaged in mercantile business till the death of his step-brother, Étienne Joseph Louis, leader of the French republican party, though he was a close attendant at the secret meetings which aided in precipitating the revolution of 1830. In 1842 he was elected to the chamber of deputies and joined the party of the extreme left, was active in all matters pertaining to industry and finance, became a notable promoter of the reform agitation 1847, and on the overthrow of the govt. of Louis Philippe, 1848, was elected a member of the provisional govt., and mayor of Paris, and Mar. 5 was appointed minister of finance. His decree of an additional tax of 45 centimes rendered him and his friends very unpopular, and, though he sat in the executive committee and the constituent assembly, caused his defeat for the legislative assembly. He was elected to the corps legislatif 1864 and the provisional govt. 1870, but defeated for the national assembly 1871, and then resumed his historical writings. He published *An Episode of the Revolution of* 1848 (1850); *The* 45 *Centimes Tax* (1859); *History of the Revolution of* 1848, 8 vols. (1860–62); *History of the Executive Committee* (1869); and *The June Days* (1873).

GARNISH, v. *gâr′nĭsh* [It. *guarnire;* F. *garnir,* to deck, to adorn; F. *garnissant,* embellishing]: to adorn; to decorate; to ornament; to furnish; to supply: N. a name formerly given to an unauthorized prison-fee in England, demanded by prisoners from new-comers. Gar′nishing, imp.: N. something added for embellishment, as round a dish at table; that which ornaments. Gar′nished, pp. *-nĭsht,* in *her.,* applied to a charge with the ornament set on it. Gar′nishment, n. ornament; embellishment. Gar′niture, n. *-nĭ-tūr* [F. *garniture,* garnishing]: ornament; furniture; dress.

GAR′NISH — GAR′NISHMENT — GARNISHEE, n. *gâr′nĭsh-ē′* [F. *garer,* beware, look out]: legal terms relating to the notice or warning given to a person in whose hands is money or other property of another party—which property has been attached by a creditor of that party—

not to deliver it to the defendant. See also FOREIGN ATTACHMENT.

In law in the United States, *garnish* is to warn; *garnishment* is the warning by process of attachment; *garnishee* is the person holding property belonging to a defendant which has been attached. In general practice garnishment denotes the process of attachment of money or goods due a defendant and at the time in the hands of a third party. The effect of the process is to warn the holder not to deliver to the defendant the articles held, but to answer the plaintiff's suit. In the United States when an attachment has been issued against a debtor after judgment in order to secure to the plaintiff a claim due by a third person to such debtor the course is to give notice to (garnish) such third person, which notice given is garnishment, and he is called the garnishee. Any person privately, corporations, and individuals acting as executors and administrators, are capable of being made garnishees, but no officer of the law or assignee in bankruptcy. See ATTACHMENT.

GARONNE (anc. *Garumna*), *gâ-rōn′*: principal river in the s.w. of France, rises within the Spanish frontier in the Val d'Aran, at the base of Mount Maladetta, in the Pyrenees. About 26 m. from its source, it enters French Territory in the dept. of the Haute Garonne, flows n.e. to Toulouse, then bends n.w. until, joined by the Dordogne about 20 m. below Bordeaux, and widening afterward into the estuary which bears the name of the Gironde, it enters the Atlantic at the Pointe de Grave. The basin of the Garonne is more than 200 m. in length, and about an equal extent in width at its broadest part; though narrowing in the n.w. to 25 m. The total length of the river is about 350 m.; and its natural navigation, though much impeded above Toulouse, commences at Cazères, 262 m. from its embouchure. At Bordeaux, the river attains a breadth of 1,603 ft. Its principal affluents are the Tarn, Aveyron, Lot, and Dordogne, on the right; and on the left, the Save, Gers, and Baise. At Toulouse it is joined by the Canal du Midi, which, running e. to the Mediterranean, forms with the Garonne communication between the Mediterranean and the Atlantic. The valley of the Garonne is noted for beauty of scenery, and abundant produce of corn and wine. The estuary of the Gironde is 40 m. in length, and about 4 m. in average breadth. Below Blaye, its shores consist of bare rocks and bleak and dreary heath.

GARONNE, *gâ-rōn′*, HAUTE: dept. in s. of France, bounded s. by the Pyrenees, w. by the departments of Hautes Pyrénées and Gers; 2,420 sq. m. It is watered throughout by the Garonne, from which it derives its name, and within the basin of which it wholly lies. Occupied in the s. by a branch of the Pyrenean range, the slope of the dept. and the course of its streams, are toward the n. and n.e., where the land is generally level. The soil is on the whole good; that in the valleys is remarkably

productive, and brings forth heavy crops of grain, maize, flax, and potatoes. Orchard-fruits, with melons and tobacco are produced in abundance, and the annual yield of wine is about 14,300,000 gallons, two-thirds of which is exported. Minerals also abound, but, with the exception of iron have not yet been obtained in any great quantity. The chief manufactures are woolen and cotton fabrics and hardware; and these, with timber, cattle, wine, and preserved meats, are principal exports. The dept. was formerly divided between the provinces of Languedoc and Gascony. It is divided into the four arrondissements, Toulouse, Muret, St. Gaudens, and Villefranche, with Toulouse as capital. Pop. of dept. about 450,000.

GAROOKUH, n. *gâr-ôk-ŭh* [Pers. or Arab.]: a vessel of the Persian Gulf, from 50 to 100 ft. long, having a short keel and a long overhanging prow and stern; used principally for fishing purposes.

GARPIKE, n. *gâr′pīk* [see GARFISH]: the garfish or sea-needle; an Amer. fresh-water fish covered with bony plates.

GARRARD, *gâr-rârd′*, JAMES: 1749, Jan. 14—1822, Jan. 19; b. Stafford co., Va.: soldier and governor. He became a col. in the revolutionary army, member of the Va. legislature, pioneer of Bourbon co., Ky., 1782, Baptist minister, and gov. of Ky. 1796–1804. He was a strong advocate for religious liberty in Va., and for the exclusion of slavery from Ky. by constitutional enactment.

GARRARD, KENNER: 1828–1879, May 15; b. Ky.: soldier. He graduated at the U. S. Milit. Acad. 1851; entered the army as brev. 2d lieut. artil.; was transferred to 1st U. S. dragoons 1852, promoted 2d lieut. 1853, 1st lieut. of cav. 1855, capt. 1861, maj. 1863; was appointed col. 146th U. S. vols. 1862, Sep.; promoted brig. gen of vols. 1863, July; mustered out of vol. service 1865, Aug.; brevetted col., brig.gen., and maj. gen. U.S.A. for gallant services through the war; and resigned from the regular army 1866, Nov. 9.

GARRET, n. *găr′rĕt* [OF. *garite*, a place of refuge, the tower of a castle—from *garir*, to take refuge: comp. Gael. *garait*, a hiding place]: the apartments of a house immediately under the roof. GAR′RETED, a. *-rĕt-ĕd*, located in a garret; turreted. GARRETEER′, n. *-ēr′*, one who lives in a garret: applied to poor authors.

GARRETT, *găr′rĕt*, ALEXANDER CHARLES, D.D., LL.D.: Prot. Episc. bp.: b. Ballymot, Ireland, 1832, Nov. 4. He graduated at Trinity College, Dublin, 1855, was ordained deacon 1856, July 6, and priest 1857, July 7, was curate of East Worldham, Eng. 1857–59, missionary in British Columbia 1859–69, rector of St. James' (Prot. Episc.) Church, San Francisco, 1869–72; rector of Trinity Cathedral and dean of the chapter, Omaha, 1872–74; was consecrated missionary bishop of n. Texas, 1874, Dec. 20.

He received the degree D.D. from Nebraska College 1872 and Trinity College, Dublin, 1882, and LL.D. from the University of Mississippi 1876.

GAR'RETT, ELIZABETH, M. D.: see ANDERSON, ELIZABETH (GARRETT), M.D.

GAR'RETT, JOHN WORK: 1820, July 31—1884, Sept. 26; b. Baltimore: capitalist. He spent one year in Lafayette College (1834–5), then entered his father's mercantile office, and was admitted to partnership in the firm of Robert G. & Sons 1879. In 1857 he became a director of the Baltimore and Ohio railroad, in 1858 was elected pres. and so served till his death. Under his management the road paid its first dividend on one year's operations, and was relieved of its floating debt at the end of his second year. He promoted the establishment of steamship lines between Baltimore and Bremen, Baltimore and Liverpool; organized the Baltimore and Ohio Express Company and the Baltimore and Ohio Dist. Tel. Company, and became an active trustee of Johns Hopkins University.

GARRETT, ROBERT: railroad pres.: 1847, Apr. 9—1896, July 29; b. Baltimore; d. Deer Park, Md. He was educated at Princeton Coll., graduating 1867, and entered the banking house of Robert Garrett & Sons. In 1875 he became interested in the Baltimore and Ohio r.r., of which he was made pres. 1884. He established the B. & O. telegraph and express systems. Suffering from a mental affliction he resigned the presidency and went abroad 1887, but returned 1888. GARRETT, MARY ELIZABETH: sister of the preceding: a philanthropist and promoter of higher education for women, who, in 1892 founded a medical college for women and men, donating more than $300,000 for the purpose.

GAR'RETT, THOMAS: abolitionist: 1783, Aug. 21—1871, Jan. 23; b. Upper Darby, Penn.; of Quaker parentage. He learned the edge-tool making trade with his father, settled in Wilmington, Del. 1820, and carried on the iron and hardware business, becoming very wealthy. His anti-slavery feelings had been aroused 1807 by the kidnapping from his father's house of a colored woman servant, and after settling in Wilmington he began studying the condition of the slaves. His anti-slavery opinions were widely spread, his name was passed from slave to slave till thousands came to recognize him as their friend and to seek his aid in gaining freedom, and though he aided the escape of more than 3,000 he shrewdly avoided a breach of the law. After the passage of the fugitive-slave law he was twice convicted of violating its provisions and fined so heavily that he lost his entire fortune. He was warned by the U. S. dist. court judge to desist from his practice, but he openly declared that his door should never be closed against a fugitive slave. He had established so high a reputation for integrity and business ability that the citizens of Wilmington gave him capital to

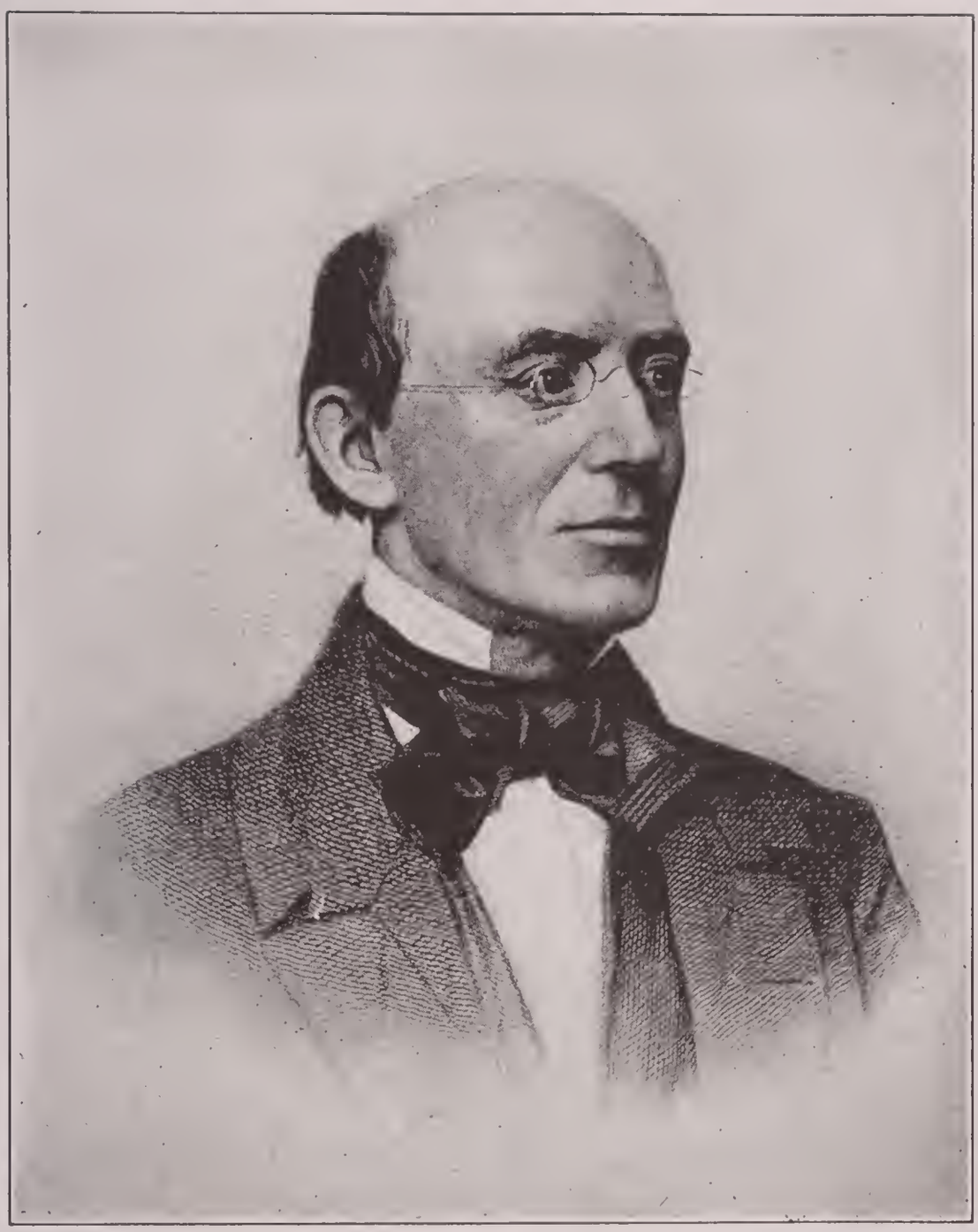
resume business, and the banks lent him money without security. The day of his funeral was one of general mourning, and in accordance with his instructions his body was carried to the grave by colored people.

GARRICK, *găr'ĭk*, DAVID: 1761–79, Jan. 20; b. Hereford: English actor and author. He was educated at the grammar school of Lichfield. After a short residence at Lisbon with an uncle, a wine-merchant, he returned to England, and 1735 became a pupil of the famous Dr. Johnson; but after six months, master and pupil both proceeded to London, with the view of improving their fortunes. Garrick attempted the study of law, but an irresistible instinct soon urged him to the stage. He made his *début* at Ipswich 1741, as Aboan, in *Oroonoka*, with great success; and ventured to appear before a London audience in the autumn, and in the character of Richard III. was received with prodigious applause. The fashionable theatres were emptied to gaze upon the new star that was shedding an unwonted lustre on the obscurity of the Goodman's Fields' stage, and the other theatrical celebrities, such as Quin and Cibber, could not conceal their chagrin and disgust. In the following year Garrick accepted an engagement at Dublin, where he excited the Hibernian enthusiasm to a miraculous degree. The playhouse, we are told, was so crowded, 'that a very mortal fever was produced, which was called Garrick's fever.' In 1747, he became joint-patentee of Drury Lane and two years later married Mademoiselle Violette, a foreign *danseuse*, and to prevent the ridicule which he feared, he got his friend Edward Moore 'to write a diverting poem upon his marriage.' This was not the only occasion when his sensitiveness to malicious banter induced him to forestall the wits and critics, and so blunt the edge of their jests and criticisms. Before acting Macbeth for the first time, he wrote a humorous pamphlet, reflecting on the 'mimical behavoir of a certain fashionable faulty actor,' to wit, Garrick himself. In 1763 he visited Italy, and 1769 projected and conducted the memorable jubilee at Stratford-upon-Avon in honor of Shakespeare. He died in London, having accumulated a fortune of £140,000. Garrick ranks as one of the greatest—perhaps the very greatest—of English actors. He exhibited a Shakespearean universality in the representation of character, and was equally at home in the highest flights of tragedy and the lowest depths of farce. But the *naturalness* which so wonderfully marked him on the stage, often forsook him in real life. He was jealous to an extreme, and had an unbounded stomach for flattery. His friend Goldsmith hits off his character happily in the poem, entitled *Retaliation*. As a dramatic author, Garrick does not hold a high place. He wrote about 40 pieces, some original, but mostly adaptations of old plays. His prologues and epilogues, however, deserve considerable praise. See his life by Percy Fitzgerald (2 vols. 1868).

GARRISON, n. *găr′rĭ-sŭn* [Norm. F. *garnison*, any garnishing, munition, or provision of war—from *garnisant*, supplying; *garnir*, to supply (see GARNISH)]: a fortified place; the body of troops stationed in a fort or town, either for defensive purposes or as ordinary quarters: V. to place troops in a fort or town for its defense; to secure by fortresses. GAR′RISONING, imp. GAR′RISONED, pp. *-sŭnd*.

GARRISON, WENDELL PHILLIPS, American editor: b. Cambridgeport, Mass., 1840, June 4; d. South Orange, N. J., 1907, Feb. 27. After graduation from Harvard (1861), he became literary editor of the New York *Nation* in 1865. In collaboration with his brother, F. J. Garrison, he wrote *The Life of William Lloyd Garrison*, his father.

GARRISON, *găr′ĭson*, WILLIAM LLOYD: 1805, Dec. 10—1879, May 24; b. Newburyport, Mass.: American abolitionist. His father was a man of literary taste and ability, but falling into dissolute habits, deserted his wife, who, for the support of her family, had to act as professional nurse. As early as 1814, William was apprenticed to a shoemaker at Lynn, but his mother, finding that the business did not suit him, sent him back to Newburyport, where he went to school for some time, working out of school hours to pay his board. In 1818, he began to learn cabinet-making, but this proving also distasteful to him, he was, in Oct. of the same year, apprenticed to the printer of the *Newburyport Herald*. This occupation suited his taste; he soon made himself master of the mechanical part of the business, and when only 16 or 17 years of age began to write for the *Herald*. His contributions, which were anonymous, were favorably received, and he soon began to send articles to the *Salem Gazette* and other papers, drawing the attention of political circles by a series of articles under the signature Aristides, with the view of removing the almost universal apathy on the subject of slavery. In 1824, he became editor of the *Herald;* and in 1826, proprietor and editor of the *Free Press*, in which he was accustomed to set up his own editorial articles in type, without writing them out. This enterprise was financially unsuccessful, and he went to Boston, where he worked for a time as a journeyman-printer. In 1827, he became the editor of the *National Philanthropist* in that city; 1828 he joined a friend in the publication of the *Journal of the Times* at Bennington, Vt., and 1829 he joined Benjamin Lundy at Baltimore, in editing the *Genius of Universal Emancipation*. The vigorous expression of his anti-slavery views in this last paper led to his imprisonment for libel, from which he was released by Mr. Tappan, a New York merchant, who paid his fine. He now prepared a series of emancipation lectures, subsequently delivered in New York and other places. He returned to Boston, and 1831 started the *Liberator*, a paper with which his name is inseparably associated, and which he carried on for 35 years, until



WILLIAM LLOYD GARRISON.

slavery was abolished in the United States. For the first few years almost every mail brought letters to Garrison threatening his assassination if he did not discontinue this journal; the legislature of Georgia offered a reward of $5,000 to any one who should prosecute and bring him to conviction in accordance with the laws of that state; in 1835 he was severely handled by a Boston mob, and the mayor of that city was constantly appealed to from the South to suppress his paper. In spite of all, he successfully persevered. In 1833, he visited Great Britain, and on his return organized the American Anti-slavery Soc., of which he was afterward president. He visited England again, in the furtherance of his anti-slavery opinions, 1846 and '48. In 1865, after the total abolition of slavery in the United States, his friends presented him with $30,000 as a memorial of his services. In 1867 he was once more in England, and entertained at a public breakfast in St. James' Hall, where he was the recipient of compliments from the Duke of Argyll and John Bright. He died at New York. Some *Sonnets and other Poems* by him were published 1847; *Selections from his Writings and Speeches*, 1852; *Life*, by his children, 1885.

GARROT, *găr'ot* (*Clangula*): genus of the oceanic section of Ducks (q.v.), having the bill shorter than the head. One species, the GOLDEN-EYE (*C. vulgaris* or *C. chrysophthalmus*), a bird not quite so large as a widgeon, is a common winter visitant of the central and southern parts of Europe, and of the temperate parts of Asia and N. America, appearing in small flocks, most frequently in severe weather, not only in estuaries, but on the lakes and rivers of inland parts of the country. It breeds in arctic and subarctic regions, preferring wooded districts, and forms its nest either on the ground, in the crevice of a rock, or the hole of a tree. The parent birds are said to transport their young from the nest to the water, holding them under the bill, and supported by the neck. The Lapps take advantage of the predilection of the golden-eyes for making their nests in holes, by setting up boxes for them, and then robbing them of their eggs.—Another species is the HARLEQUIN GARROT, or HARLEQUIN DUCK (*C. histrionica*), a rare winter visitant: It is a native of the n. parts of the world generally. The male is curiously streaked and marked with white.—The BUFFEL-HEADED GARROT, or BUFFEL-HEADED DUCK (*C. albeola*), is very common in N. America, where it is often called the Spirit Duck, a name which is said to have been bestowed in allusion to its power of eluding observation by diving. It is rather smaller than the golden-eye and harlequin garrot. The flesh of the garrots is eaten, but not very highly esteemed.

GARROTTE, or GARROTE, or GAROTE, n. *gă-rŏt'* [Sp. *garrote*, strangling a criminal with an iron collar: F. *garrotter*, to tie fast or bind with cords]: capital punishment in Spain and the Spanish colonies. The term signifies

also strangulation, and a bow-string as the instrument of strangulation. The punishment originally consisted in simply placing a cord round the neck of a criminal seated on a chair fixed to a post, and then twisting the cord by means of a *stick* (whence the name) inserted between it and the back of the neck, till strangulation was produced. Afterward a brass collar was used, containing a screw, which the executioner turned till its point entered the spinal marrow where it unites with the brain, causing instantaneous death. The inquisitors were wont to grant as a favor this mode of strangulation, before being burned, to such condemned persons as recanted. If the executioner was unskillful, however, the pain was sometimes very great. Llorente (*Hist. de l' Inq.*, III. 472) mentions that at an *Auto da Fé* (q.v.) at Cuença, a poor Jew who had obtained this dismal privilege of preliminary strangulation, noticing the bungling manner in which the executioner had performed the operation on the two who preceded him, said to the official: 'Peter, if you are likely to strangle me so clumsily, I would much rather be burned alive.' The same process was applied as a species of torture to the limbs, also, or to such portions of the body as might be injured with comparative impunity. It is probable that the Spaniards adopted the garrotte from the Moors; at all events, in its primitive form, it exactly resembles the punishment of the bowstring in use among Mohammedan nations.—Garrotting is also an English and American name for a species of robbery, in which the robbers suddenly come behind their victim, and throwing a cord or handkerchief, or something of the sort, round his neck, produce temporary strangulation till their purpose is effected. GARROTTE, v. to render suddenly insensible by compressing the throat, etc., and then to rob. GARROTTING, imp.; N. the practice or method of garrotters. GARROT'TED, pp. GARROT'TER, n. *-tėr*, one who attacks by garrotting; a machine for hooping casks by squeezing their staves together.

GARRULAX, n. *găr'rū-lăks* [L. *garrulus*, prattling]: genus of *Corvidæ* (crows), sub-family *Timalinæ*. *G. lencolophus* is the laughing crow of India, and *G. chinensis*, the Indian black-faced thrush.

GARRULOUS, a. *găr'rû-lŭs* [L. *garrŭlus*, chattering, prating—from *garrĭō*, I chatter, I prate: It. *garrulo*]: talkative; chattering; loquacious. GAR'RULOUSLY, ad. *lĭ*. GARRUL'ITY, n. *rôl'ĭ-tĭ*, and GAR'RULOUSNESS, n. *-nĕs*, the practice or habit of talking much.

GARRULUS, n. *găr'rû-lŭs:* type of the sub-family *Garrulinæ*, a sub-family of *Corvidæ*, containing the jays; found in both e. and w. hemispheres.

GARTER, n. *gâr'tėr* [F. *jarretière;* prov. F. *gartier*, a garter—from *jarret*, or *garet*, the ham or back of the leg: W. and Bret. *gar*, ham]: a string or band used to hold up the stocking on the leg; the badge of the highest order of knighthood in Great Britain; the order itself (see BEND, in

HERALDRY): V. to bind or invest with the garter. GAR'TERING, imp. GAR'TERED, pp. *tėrd:* ADJ. wearing a garter.

GARTER, ORDER OF THE: highest and most ancient orders of knighthood in Britain; and one of the most famous, though not the most ancient, of the military orders of Europe; instituted 1344 (or 1350) by king Edward III. Selden says that it 'exceeds in majesty, honor, and fame all chivalrous orders in the world.' It is said to have been devised for the purpose of attracting to the king's party such soldiers of fortune as might be likely to aid in asserting the claim which he was then making to the crown of France, and intended as an imitation of king Arthur's round table. The round table was erected at Windsor, and the knights and nobles who were invited from all parts of the world were exercised at tilts and tournaments as a preparation for the magnificent feasts that were spread before them. That general 'jousts and tournaments' of this description were held at Windsor, is known from the letters summoning them bearing date 1344, Jan. 1, quoted by Sir Harris Nicolas in his *Orders of Knighthood,* i. p. 6; and from the narrative of Froissart, who connects them with the institution of the order. The original number of the knights of the garter was 25, his majesty himself being the 26th. The story that the Countess of Salisbury let fall her garter at a court ball when dancing with the king, and that the king picked it up and tied it round his own leg; but that, observing the jealous glances of the queen, he restored it to its fair owner with the exclamation, *Honi soit qui mal y pense,* is about as well authenticated as most tales of the kind; and has in its favor moreover, that it accounts for the otherwise unaccountable emblem and motto of the order. Sir Harris Nicolas, whose error does not usually lie in the direction of credulity, says, that though the writers on the order have treated this story with contempt, they have neither succeeded in showing its absurdity, nor suggested a more probable theory. Various dates are assigned to the order. Froissart, as above mentioned, gives 1344, and fixes on St. George's day (Apr. 23), but Stow, and, it is said, the statutes of the order, fix it six years later. The original statutes have long since perished, and little reliance can be placed on the modern copies of them, and nothing is known on the subject with precision till the compilation of the *Black Book* in the latter part of the reign of Henry VIII. In these circumstances, Sir Harris Nicolas is of opinion, that, though founded at the former period, it was not till the latter that the order was finally organ-

Star of the Order of the Garter.

ized and the companions chosen. Another story attributes the institution to Richard I., who at the reign of Acre tied thongs of leather around the legs of some officers as badges of distinction: see Brande and Cox. The order was founded in honor of the Holy Trinity, the Virgin Mary, St. Edward the Confessor, and St. George; but the last, who had become the tutelary saint of England, was considered its special patron; and for this reason it has always borne the title of 'The Order of St. George', as well as of 'The Garter'. A list of the original knights, or knights founders, is given by Sir Harris Nicolas.

Collar, Badge, and Garter.

The well-known emblem of the order is a dark-blue ribbon edged with gold, bearing the motto *Honi soit qui mal y pense*, in golden letters, with a buckle and pendant of gold richly chased: it is worn on the left leg below the knee. The mantle is of blue velvet, lined with white taffeta, and on the left breast a star is embroidered. The hood and surcoat are of crimson velvet, lined with white taffeta. The hat is of black velvet, with a plume of white ostrich feathers, in the centre of which is a tuft of black herons' feathers, all fastened to the hat by a band of diamonds. The collar is of gold, of 26 pieces, each in the form of a garter. The 'George' is the figure of St. George on horseback encountering the Dragon, and is worn hanging from the collar; there is a 'lesser George' pendent to a broad dark-blue ribbon over the left shoulder. The Star, of eight points, is silver, and has on the centre the Cross of St. George, gules, encircled with the garter. The officers are—the Prelate (Bp. of Winchester), the Chancellor (Bp. of Oxford), the Registrar (Dean of Windsor), the Garter King of Arms, and the Usher of the Black Rod.

GARTER-SNAKE, or GRASS-SNAKE. Names given in the United States to several small striped harmless serpents of the genus *Eutænia*, especially *E. sirtalis*, which abounds in all temperate parts of the continent from Gautemala to Canada, and is exceedingly variable. This species varies in color from light-green through olivaceous to black, marked by three stripes, but only the one along the spine is well defined, those on the sides being often obscure, broken or altogether absent. The spaces between these may be spotted in double rows, or not at all; and the belly, usually light greenish-blue, may be darker, almost to blackness. Some varieties have a metallic lustre. The ordinary eastern specimens are olive-brown, with dull spots and stripes. It is everywhere abundant,

frequenting grassy meadows, farm-fields, roadsides and gardens, where it searches for mice as the principal part of its food, but it eats insects, small toads and frogs, and the eggs and young of birds whose nests are on or near the ground, for it is not a bold climber. It is abroad by day as well as by night, and itself forms the prey of such larger snakes as the blacksnake and king-snake. In the West it eats all the young gophers and ground-squirrels it can get, and in these habits commends itself to the protection of agriculturists. They swim well and hide clearly in water, and in many habits, as in structure, resemble the watersnakes (*Natrix*); and like them they are pugnacious, and quick to bite when handled, but their teeth are minute and the bite, of course, quite harmless. Their abundance is due to these qualities, not only, but even more to their great fecundity, 25 to 40 young in a season not being an uncommon product for one mother. When cold weather approaches, these serpents seek underground retreats, such as old gopher-holes, and there often gather in large numbers which hibernate entwined together in a mass; mating takes place at this season. The skin is usually shed in the spring, by creeping through some crevice and scraping off the old hide, which peels backward from the head. For the indentification of the various species of this wholly American group the reader should consult Cope's *Crocodilians, Lizards, and Snakes of North America*, published by the Smithsonian Institution in 1900.

GARTH, n. *gârth* [Scot. *garth;* W. *gardd*, an inclosure]: an inclosure; a yard; an inclosed garden; in *Orkney*, a house and the land attached; a dam or inclosure for catching fish.

GARTH, *gârth*, Samuel M.D.: 1660–1718, Jan. 18; b. Bolam, county of Durham, England: physician and poet. He was a member of Peterhouse, Cambridge, and graduated M.D. 1691. In the following year, he settled in London, and was admitted into the College of Physicians, in which he subsequently held important offices. His professional skill was associated with great conversational powers, and he soon acquired extensive practice. The year 1700 presents an honorable incident in Garth's life: he provided a suitable interment in Westminister Abby for the neglected corpse of Dryden, which he caused to be brought to the College in Warwick Lane; and he pronounced a eulogium over the great poet's remains. On the accession of George I., he received knighthood, was appointed physician in ordinary to the king, and physician-gen. to the army. He died in London. Garth is known in literary history as the author of *The Dispensary*, a poetical satire on the apothecaries and those physicians who sided with them in opposing the project of giving medicine gratuitously to the sick poor. The sketches of some of his contemporaries—e.g., Drs. Gould, Tyson, and How, who are introduced into the poem as 'obsequious Umbra', 'slow Carus', and 'shrill Querpo'—are severe;

and though, doubtless, exaggerated by poetic license, must have been true to nature, or the work could not have obtained such immediate and extensive circulation. The first edition came out 1669; the second and third followed in a few months. In 1706, he brought out the sixth edition with considerable additions. In 1715, he published a poem *Claremont*, and in 1717 he superintended and contributed to a translation of Ovid's *Metamorphoses* by some of the most eminent writers of that age —Addison, Pope, Gay, Congreve, and Rowe being among the contributors. Pope frequently refers to him, both in his letters and in his poems, with great respect—

> And we, too, boast our Garth and Addison,

Pope's second *Pastoral* was dedicated to Garth.

GARTNER, *gĕrt'nĕr*, Friedrich von: 1792–1847, Apr. 21; b. Coblentz: German architect. His father, also an architect, removed 1804 to Munich, where young Gartner received his first education in architecture. To complete that education, he traveled 1812 to Paris; and 1814 to Italy, where he spent four years in earnest study of antiquities. The fruits of this labor appeared 1819 in some views, accompanied by descriptions of the principal monuments preserved in Sicily (*Ansichten der am Meisten erhaltenen Monumente Siciliens, Lithographien mit erläuterndem Text*). After a visit to England, he was called, 1820, to the chair of Architecture in the Acad. of Munich. With this appointment began his work as a practical architect. Many of the architectural ornaments of Munich, and various other buildings throughout Germany, as well as the new royal palace at Athens, are built from his plans. In the style of his works, which all have a common impress, Gartner represents the renaissance of the mediæval architecture in its Romanesque forms. The round arch with its accompaniments prevails in them all. Gartner was rewarded with the fellowship of several academies, with orders of his own and foreign countries, with a degree from Erlangen, with the office of head govt.-surveyor of buildings, and with the directorship of the Acad. of Arts in Munich.

GARUM, n. *găr-ŭm* [L.]: kind of fish-sauce, prepared from several kinds of fish, particularly the scomber, but formerly from the garus; a pickle made of the gills and blood of the tunny.

GARY, James Albert: an American statesman; 1833, Oct. 22, b. in Conn.; was educated at Allegheny College, Pa., and settled in Maryland 1840. In 1861 he became a partner in the cotton-duck manufacturing firm of his father, whom he succeeded as head of the establishment in 1870. He was defeated as Republican candidate for governor of Maryland in 1879, and was postmaster-general in 1897–98.

GAS, n. *găs* [a word coined by Van Helmont to signify the most subtle and volatile part of anything: comp. Ger.

geist, ghost, spirit]: an aeriform fluid; any air, the carburetted hydrogen used for illumination. GASALIER, n. *găs'ă-lēr*, a branching apparatus for giving light by gas in rooms. GASEITY, n. *găs-ē'ĭ-tĭ*, the state of being in the form or condition of a gas. GASEOUS, a. *găz'ē-ŭs*, in the form of gas. GASOMETER, n. *găs-ŏm'ĕ-tėr* [Gr. *metron*, a measure]: the large gas-holder of a gas-work (see GAS, LIGHTING BY). GASOM'ETRY, n. *-trĭ*, the art or act of measuring gas; spelled also GAZOMETRY. GAS-FITTINGS, the different contrivances for the application of gas-lighting. GAS-FITTER, n. one who fits up the pipes, etc., for giving light by gas. GAS FURNACE (see IRON). GAS-HOLDER, a vessel for containing and distributing gas (see GAS, LIGHTING BY). GAS-METER, any apparatus used for measuring the volume or quantity of gas consumed. GAS-WORKS, the place where gas is manufactured. GASIFY, v. *găs'ĭ-fī*, to turn or change into gas. GAS'IFYING imp. GAS'IFIED, pp. *-fīd*. GAS'IFICA'TION, n. *-fĭ-kā'shŭn* [L. *facĭō*, I make]: the process of converting into gas.

GAS, LIGHTING BY: most common mode of obtaining artificial light in recent years, though hardly known at the beginning of the past century. It is now extending even in the larger cities of Asia. From 1658 to 1739, the attention of men of science in England had been repeatedly turned to the streams of inflammable air issuing from wells and mines in the coal districts, various communications on the subject having been read before the Royal Soc. of London. In 1739, the Rev. Dr. John Clayton, Dean of Kildare, gave an account of experiments in which he had distilled gas from coal. It was not, however, till 1792 that the possibility of applying gas, distilled from coal, to the production of artificial light was demonstrated. In that year, William Murdoch constructed apparatus by which he lighted his house and offices at Redruth, in Cornwall. In 1798, he lighted part of the manufactory of Bolton and Watt at Soho; and in 1805 he lighted the cotton mills of Phillips and Lee at Salford.

The first gas applied to artificial lighting was obtained from coal; and owing to the abundance of bituminous coal the same method has been followed in England and on the Continent of Europe.

The history of the gas industry in the United States dates from 1806, when David Melville of Newport, R. I., lighted his premises by coal gas of his own manufacture. The apparatus used by Melville was crude, but underwent improvements from time to time, until, in 1813, he secured a patent, and later used gas for the lighting of a cotton mill at Watertown, Mass. Gas was also used at about this time in a mill near Providence, R. I., and was employed in 1817 as an illuminant in a lighthouse. In 1816 a company was chartered in Baltimore, Md., followed, in 1822, by the establishment of a plant in Boston. New York City adopted gas lighting in 1823, and two years later companies were also formed in

Brooklyn, N. Y., and Bristol, R. I. In the early days of the industry the gas manufactured had an illuminating value of about 15 to 17 candlepower. Compared with the light of candles or of the crude whale-oil lamps then in use, it was considered a wonderful illuminant. This superiority was soon threatened, however, by the introduction of kerosene and improved oil lamps, the general use of which interfered seriously with the rapid increase of the sale of gas.

Philadelphia and other large cities did not start gas-works until 1835 or later. By 1850 the industry was fairly well established, there being thirty companies, with $7,000,000 of capital, using materials of the value of half a million yearly and manufacturing gas valued at nearly $2,000,000. Gas companies multiplied rapidly during the next decade, there being nearly 300 in 1860. In 1905 1,019 gas companies were doing business, giving employment to 40,000 people, and distributing $125,000,000 worth of products. Measured by the capital invested, gas is the fourth largest industry in the United States; measured by the number of establishments and the wages paid, it is the thirty-sixth, and by the net value of products the thirty-third. The capital invested in 1905 was given as $725,000,000.

Many different sorts of gas may be used for illumination. Of these *natural gas*, or *rock gas* as it is sometimes called, is used where available, as in the petroleum and gas region of Pennsylvania. See GAS, NATURAL. It usually requires to be enriched for lighting purposes by admixture with naphtha vapor. Gas made largely from petroleum is known as *oil-gas*, while oil or naphtha adapted to use for enriching natural gas or water-gas is termed *gas-oil*.

Coke-oven gas is a by-product obtained in the manufacture of coke. It may be used to make illuminating gas, or gas for fuel or power purposes. *Producer gas* is a cheap gas made from any convenient material for power or fuel, being deficient in illuminant. See GAS PRODUCER. *Blast-furnace gas* is a by-product of the blast furnace (q.v.), and is used principally for power. *Acetylene gas* has come into considerable use for lights on bicycles and automobiles. See ACETYLENE.

All kinds of coal will yield gas. If coal be stored for a long time in bins it loses some of its gas, and is of less value. Storing the coal under water tends to retain the gas; dry heat tends to draw it out. When the coal is highly heated, as in making coke, the gas is released rapidly, and is said to distill. This is the primary method of making coal gas for illumination. By this simple process a ton of good coal will yield about 10,000 cubic feet of coal-gas.

Illuminating gas sells in the cities of the United States at an average figure of a fraction over $1 per 1,000 feet. At the last census the annual sale of illuminating gas in New York city was over 18,000,000,000 cubic feet.

The water gas plant, erected at Astoria in 1906 for supplying New York City, has an ultimate capacity of 20,000,000,000 feet yearly, and is the largest and finest gas plant in the world, costing about $25,000,000.

The first process in making coal-gas is distillation, which consists in heating the coal in a large vessel or retort, which process will yield a little over 10,000 cubic feet of 18-candle power per ton of Pennsylvania gas coal. The retorts used are made of clay, or sometimes of cast iron; the round form of retort has strength and durability, but is inferior to the D-shaped or oval form as a carbonizer. The coal treated in the retort becomes coke, and by heating this until it glows, and then forcing steam through, the water is decomposed, the hydrogen being released as a gas, and thus about 30,000 feet more gas is obtained, this being called *water-gas* because there is more hydrogen in it than coal gas.

The development of water-gas, which is both better and cheaper, put illuminating gas in a position to compete with kerosene. By far the greater portion of the gas now manufactured is water-gas, this process producing so much more gas from a given quantity of coal, though it has the disadvantage of being much more poisonous. It is primarily somewhat deficient in illuminating power, but this is over-come by a process of carburetting, or enriching with petroleum vapor. Modern manufacture of water-gas is based on the Lowe patents of 1872 to 1875, covering the use of a generator for making a non-luminous gas, in combination with a superheater, which is an oil-gasifying chamber, fired by internal combustion. The carbonic acid gas formed during the passing of the air through the generator served as the combustible. The air being blown rapidly through the hard coal or coke fuel quickly raised it to an incandescent or white heat sufficient to decompose the steam passing through, and relieve it of its hydrogen, which combined with the gas from the coal. The gasified oil readily combined with the mixture, giving it good illuminating quality.

The first plant was erected at Phœnixville, Pa., in 1873. From that time until about 1880 this new process of making gas was vigorously opposed by coal-gas manufacturers. Gradually the opposition was overcome, and since 1880 coal-gas makers have adopted the water-gas process, and the increase in the sales of water-gas has been enormous.

The appearance of the electric light demonstrated the necessity of finding other uses for gas than those of illumination, and large quantities are now made for fuel and for driving gas engines (q.v.). The most potent factor which is enabling gas to compete with electric light, and thus contributing to increase the consumption of gas, is the widespread use of the Welsbach—named for the inventor, Auer von Welsbach, of Vienna—or incandescent mantle, which develops an illuminating power of 20 candles per cubic foot, thus doubling the

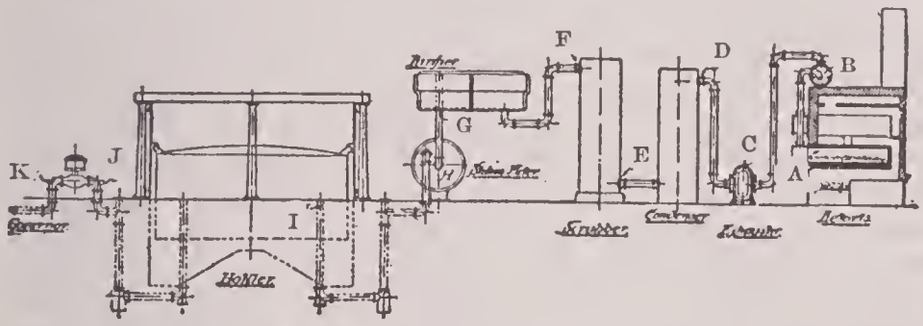
light-giving ability of water-gas as burned in an ordinary burner. Its introduction gave a decided stimulus to the gas industry and although the use of electricity for lighting purposes is increasing much more rapidly than is that of gas, the consumption of gas also shows a marked increase.

The principle of an incandescent mantle is similar to that of the calcium light, which suggested it. Welsbach discovered that the salts of certain rare earths, as zirconium, molybdenum, etc., when heated in a flame doubled the illumination of the flame by creating a large white-hot surface. He constructed a cotton mantle, which in appearance was a small loosely woven bag of a shape adapted to fit over a candle three or four inches long. This bag-like mantle was soaked in the salts and dried, and soaked and dried again until thoroughly coated with the salts. It was then suspended over and around a gas-flame, which burned out the cotton, but left a fragile mantle of salts, whose incandescent increased the light. The manufacture of the mantles has become an important industry, and they are now applied to many electric as well as gas lights.

In comparing the illuminating power of one gas with another, the standard of comparison is the light from a sperm candle burning 120 grains of sperm per hour, the gas-burner consuming at the rate of 5 cubic ft. per hour. When the quantities consumed are different from these, the results are rectified by calculation. Bituminous coal yields from 8,000 to 12,000 cubic ft. of gas per ton, of illuminating power varying from 12 to 16 sperm candles to a burner consuming 5 ft. per hour. For making coal-gas a plant requires *retorts, ascension* and *dip pipes, hydraulic main;* then the *tar-well,* and *condenser,* the exhauster, the washer or scrubber, the *purifier,* the station-meter, the *gas-holder,* and the governor—the parts printed in italics being indispensable. The accompanying wood-cut shows an arrangement common in American gas-works.

At A is the coal being distilled. At B the gas rising from the coal is bubbling through the water in the hydraulic main. At this point the gas contains all the tar and impurities with which it leaves the coal. It is a dark brown color and so dense as to be opaque. Its temperature is approximately 200° F. It consists of hydrocarbon gases, hydrogen, carbonic oxide, water vapor, ammonia, sulphuretted hydrogen and other sulphur compounds, carbonic acid. tar—as a mist of vesicles and small drops,—free carbon and traces of nitrogen and oxygen. At C is the exhauster pumping the gas from the retorts and forcing it through the subsequent apparatus into the holder. At D the gas entering the condenser is practically as it entered the hydraulic main, except that a proportion of the tar and water vapor and all the free carbon have been deposited, due to the cooling of the gas and the friction. At E the gas entering

the scrubber has parted with practically all of the tar and most of the water vapor it contained when leaving the retort, and with the water vapor there has been deposited a certain amount of ammonia, which the water vapor absorbed as it condensed to liquid. The ammonia absorbed by the water also carried out of the gas a certain part of the carbonic acid and sulphur compounds. At F, the outlet of the scrubber, the gas has practically lost all of its ammonia, water vapor and tar. It is now transparent, and contains of deleterious constituents only sulphur compounds. At G, the outlet of the purifiers, the sulphur compounds have been removed to an extent that renders the gas fit for consumption in closed rooms. The gas may now be used without fear of injury to person or fabrics. At H the gas is passing through the station meter. At I the gas is entering the holder, where it is stored, to be used as the demand may require. At J the gas is entering the governor. At this point the pressure will vary and have no relation whatever to the requirements of the district supplied. At K the gas is leaving the governor. At this point the pressure of the gas may be varied in accordance with



the demands of the district supplied. If, owing to the approach of evening, or other causes, the consumption of the gas in the town or district increases, the governor, if automatic, will open, thus providing a passage for a larger supply of gas and increasing the pressure at the outlet of the governor. If the governor is not automatic in its action, the pressure may be varied by the addition or subtraction of weights.

The hydraulic main is a large pipe made of thick plate or cast-iron. It is first about half-filled with water, which in the course of a short time is entirely displaced by the liquid product of distillation. The dip-pipes, which are the continuation of the ascension-pipes, and are connected to them by 'bridge-pipes,' dip to a depth of ¼ to 1 in. into the liquid through which the gas bubbles up into the upper portion of the hydraulic main. The gas and liquid come off at the end of the hydraulic main, and flow together till they reach the tar-well, into which the liquid, by its greater gravity, falls. The liquid consists of tar and ammoniacal water. These are separated by standing and settling and are withdrawn from the tar-well, and become the raw material from which other products are manufactured. From the tar,

naphtha, pitch-oil, pitch, many chemical products such as the aniline colors, carbolic acid or phenol, alizarine, etc. (q.v.), and coke are obtained; and from the water, salts of ammonia are prepared. The tar and ammoniacal water being of different densities, are easily separated, by being allowed to settle in a vessel. (See GAS-TAR; NAPHTHA; SULPHATE OF AMMONIA; SAL-AMMONIAC; ETC.). When a retort is opened for withdrawing the exhausted charge of coal and renewing it, the pressure of the gas on the hydraulic main forces the liquid to ascend the dip-pipe, and thus seals it against the gas in the hydraulic, which, but for this, would rush up the dip-pipe, descend the ascension-pipe, escape, and ignite at the open mouth of the retort. In the tar-well there is also a dip-pipe, inserted into a deep vessel, to prevent the gas from entering the well. A similar contrivance is resorted to wherever it is necessary to introduce or draw off liquids at any part of the apparatus. The tar-well must be placed so low, that all the liquid in the pipes leading to it from the hydraulic main, and from it to the condenser, will incline toward it.

The simplest form of condenser consists of a series of upright pipes, each pair connected at the top by an arch pipe. These are erected upon a horizontal chest, the top of which has an opening into the bottom of each upright pipe. Immediately under the centre of each arch pipe, a plate descends from the top of the chest, and reaches to within a few inches of the bottom. When in operation, the chest is always filled with liquid to such a height, that these plates dip into it, and prevent the gas from passing through the chest horizontally. When admitted into the chest, the gas finds no exit but by ascending the first upright pipe; and, passing over the arch, it descends to the chest again through the second upright pipe. There being no dip-plate between the second and third upright pipes, the gas ascends the third pipe and descends the fourth, and so on through the condenser. The upright pipes are kept cool by exposure to the atmosphere, and sometimes a thin stream of water is caused to flow over them. As the gas ascends and descends, cooling rapidly in its passage, the liquid which has been carried along in a state of vapor, condenses, and falls into the chest, from which it is conveyed back by an overflow-pipe to the tar-well.

The exhauster, when used, may be the next part of the apparatus but its position varies in different works. It is a species of pump, driven by steam-power, and is made in various forms, both direct-acting and rotary. It serves the purpose of relieving the retorts of the resistance or pressure, created in the passing of the gas through the apparatus, and in raising the gas-holders. The use of the exhauster greatly lessens the deposit of carbon in the retorts in the form of graphite, secures a much greater yield of gas, and is attended with other important advantages.

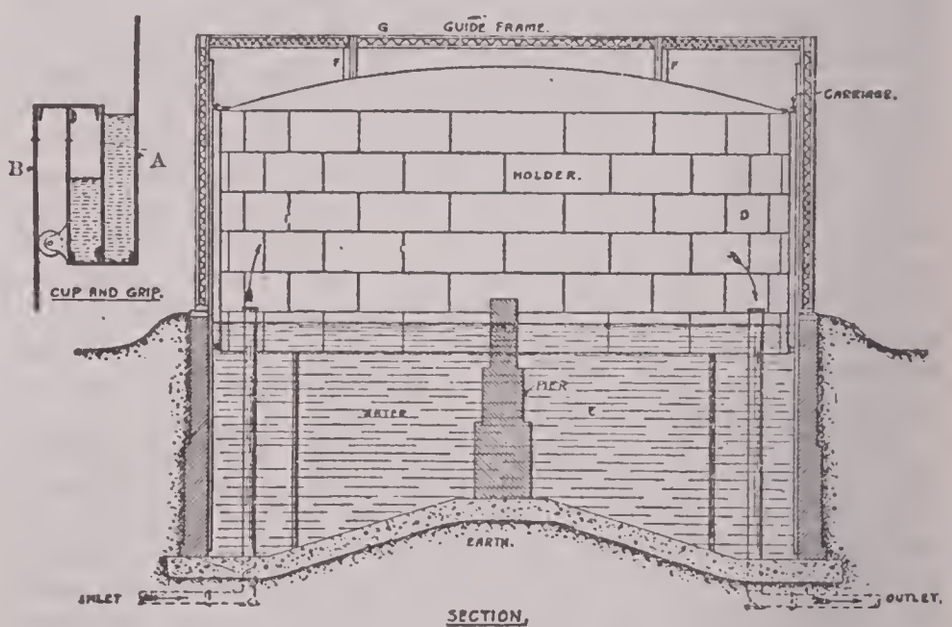
At this stage of the process, the liquid products have been separated from the gaseous. A portion of the ammonia and the sulphuretted hydrogen and carbonic acid have still to be removed. To remove ammonia from the gas, the washer or scrubber is used. In the washer, the gas is forced to pass through the water to a depth of several inches, or through a solution containing an ingredient with which the ammonia will combine. The scrubber, which may be used instead of the washer, is an upright vessel, in which the gas is made to pass through brushwood, layers of small stones, coke, or uitable shelving of wood or iron, through or over which water may be made to percolate.

There are two kinds of purifiers—the wet and the dry. Either may be used separately, or they may be used in succession. The wet variety is now rare. The dry purifier is a vessel containing a series of perforated trays, on each of which the purifying material is spread. Slaked lime (in the form of dry hydrate) is used in this purifier in layers of 2½ to 3⅓ inches on each tray. The lime absorbs the sulphuretted hydrogen, a portion of the ammonia, and the carbonic acid. When saturated, it is removed, and the vessel is refilled with fresh material. The test for its exhaustion is the action of gas drawn from its top upon paper impregnated with acetate of lead. When this turns brown or black, owing to the formation of lead sulphide, the purifier is considered exhausted as far as absorption of sulphuretted hydrogen is concerned, although then in the best condition for removing bisulphide of carbon.

The gas-holder or gasometer is an inverted cylindrical vessel of sheet-iron, placed in a tank of cast-iron, stone, concrete or the like. A pipe ascends from the bottom of the tank through the water, to admit the gas to the space between the surface of the water and the crown of the gas-holder. Sometimes a second pipe descends through the water and the bottom of the tank, for the issue of the gas to the main pipe. Frequently only one pipe is used for inlet and outlet alternately. The water is for the purpose of retaining the gas within the vessel. The pressure of the gas raises the gas-holdr; and the weight of the gas-holder, or such part of it as is not taken off by balance-weights, impels the gas through the pipes. When balance-weights are necessary, they are attached to the edge of the crown of the gas-holder by long chains, which pass over pulleys on the top of columns which serve also to guide the motion of the vessel in rising and falling.

Large gas-holders are often made of a so-called 'telescopic' type. This expression means that there are within the tank several concentric cylindrical wrought iron sections, one of which only is closed at the top—this being the inner section. The columns in this case have a height equal to the sum of the heights of all the

sections. The inner or covered section has as its lower edge a circular trough or 'cup' A (see illus.) which, as the section rises, engages with a similar but inverted trough B, called a 'grip,' on the upper circumference of the next section. The trough on the lower edge of the inner section being filled with water, a water-seal is formed, which prevents the escape of gas. When the holder is down, the cups and grips are under water. Each section, in turn, as it fills with gas, and its lower edge rises to the surface of the water, engages the next lower section in a similar manner. When all the sections are full of gas the volume contained is approximately the capacity of a single section-holder multiplied by the number of sections. The main advantage of the system is the small tank depth and ground area per unit of volume of holder capacity. As the gas flows out from the full holder, and the holder sinks into the

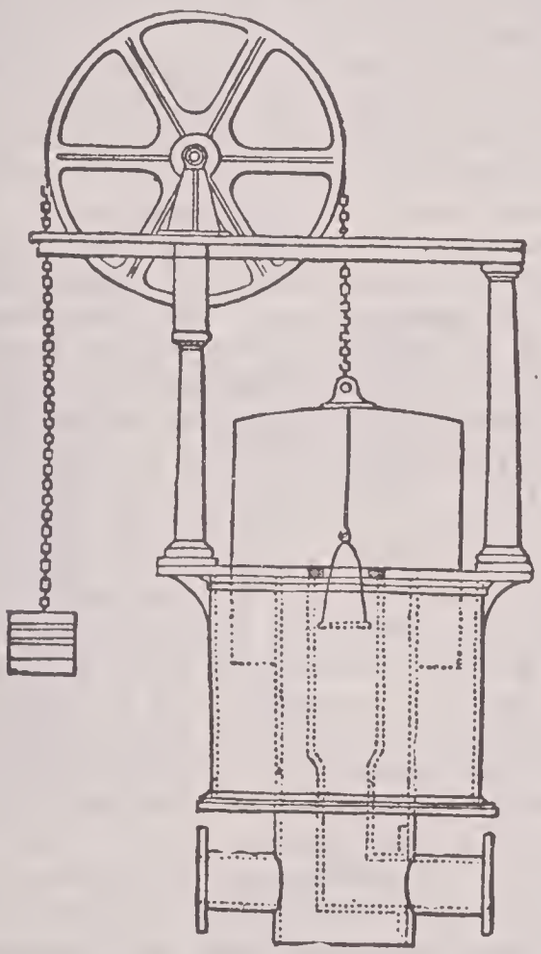


SECTION.

tank, each section in turn rests on landing stones in the bottom of the tank. The inner section is not permitted to sink so far as to touch the landing stones, but is kept always afloat, except where necessary to make repairs.

Before reaching the main-pipes, the pressure of the gas is regulated by the governor. In small establishments, the governor is very frequently dispensed with, and the pressure adjusted with sufficient nicety by the regulation of the outlet valve. The typical governor consists of a small gas-holder, the inlet-pipe to which is placed in the centre of the tank, and terminates with a plate having a circular orifice in its centre. In this orifice hangs a cone, which is attached to the crown of the small holder. When the gas is issuing slowly, the holder rises, taking with it the cone, and so restricting the orifice by which the gas enters. When the gas issues rapidly, the holder falls, and with it the cone, thereby enlarging the inlet.

The gas is conveyed from the works by main-pipes or mains of cast-iron, to which branch or service pipes are connected wherever a supply is wanted. The main-pipes require to be skilfully arranged with respect to size, carefully jointed, and laid with as few changes in their inclination as possible; but as such changes are unavoidable, it is necessary to provide for the removal of water, which, flowing along with the gas in the form of vapor, condenses in the pipes, and lodges at low points. For this purpose, a vessel, similar in construction to the tar-well, is connected to the main-pipe, and the water is re-



Gas Governor.

moved by a pump. When little condensation is anticipated, and when there is no risk of the water affecting the flow of gas, a small pipe may be attached to the main if the latter is accessible with a stop-cock to run off the water. The service-pipes should incline toward the main; and where this cannot be attained, provision should be made for drawing off water.

Gas-fittings.—The small pipes for fitting up the interiors of houses are either of wrought-iron or of soft metal. To insure permanent efficiency, it is of utmost importance that these pipes should be *capacious;* they should be laid *evenly*, with an inclination toward the meter; and where the inclination is materially disturbed,

a siphon or tray should be provided for the collection and removal of water.

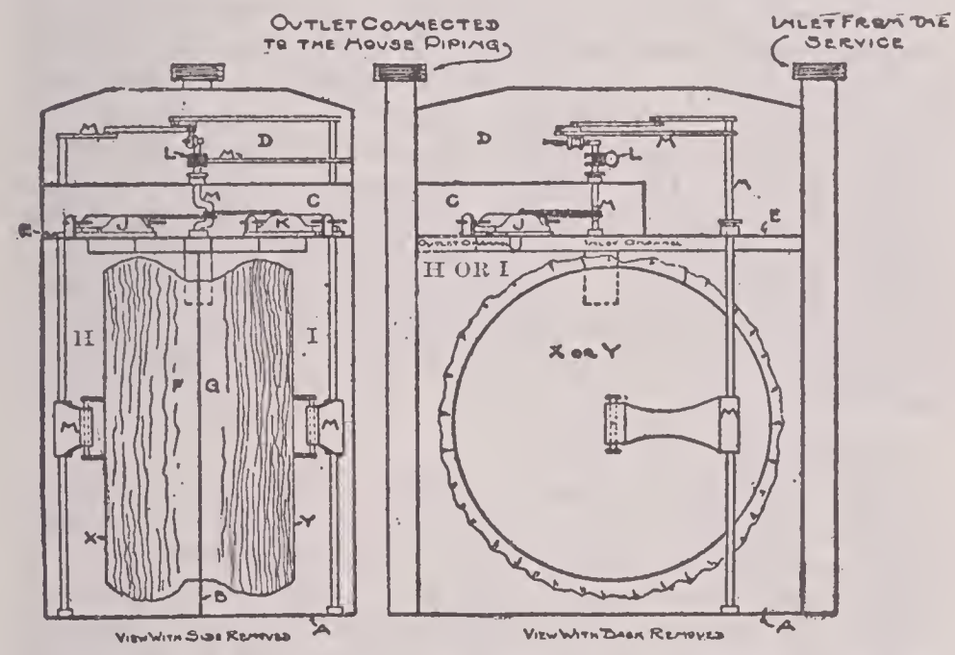
Gas for street-lighting is usually supplied by contract, a specified burner being used, and the lights being lighted and extinguished at stipulated hours. Lights in private establishments were originally charged for on the same system. The uncertainty of such a mode of charge directed the attention of gas-engineers to the construction of meters at a very early period. Accordingly, in 1816, Mr. Clegg took out his first patent for the wet gas-meter, which, subsequently improved by Malam, Crosley, and others, came into general use about 1822. Dry gas-meters are now extensively manufactured on a principle first patented by A. A. Croll, who has patented also various modifications of the apparatus and processes used in the manufacture, purification and the utilization of gas.

The wet gas-meter consists of a hollow circular case, somewhat more than half filled with water. The measurement is made by the cylinder, a hollow drum or wheel, which revolves on a horizontal axis inside the case, the pressure of the gas supplying the motive-power. The cylinder is divided into four chambers by partitions running in a slanting direction from back to front.

The meter used in cold countries to measure the gas supplied to an individual consumer is almost universally of the 'dry' type, which, as shown in the illustration, consists of a tin box, A, divided into two measuring compartments by a vertical partition, B, these measuring compartments being separated from the superimposed valve and dial compartments, C and D, by a horizontal partition E. The gas is measured in the bellows F and G, and in the measuring spaces H and I, surrounding the bellows. Each bellows and each surrounding measuring space is alternately filled with gas, shut off for a moment from any connection with either the inlet or the outlet of the meter, and then opened to the outlet. This filling and emptying is so alternated that there is a continuous flow of gas through the meter, as long as there are any openings for the escape of gas in, or connected with, the house piping connected to the meter outlet. When no openings exist there is no place for the gas to escape and the meter will not move. To understand the action of the meter it is best to follow it through a complete cycle—see illustration. Assuming the burners to be all shut off and no leaks to exist in the house piping, the pressure on the outlet of the meter will be the same as on the inlet, no gas will pass, and as it is the passing of gas that moves the meter, it will be at rest.

In whatever position the bellows and connected valves of the meter may be, and whether the meter be in action or at rest, there is always an opening for the gas into one of the bellows or measuring spaces, and another opening from the other bellows or measuring space into the meter outlet and house piping. If a burner cock be

opened, the gas in the house pipes will begin to flow out through the burner, the pressure in these pipes and in the bellows, or measuring space, at the moment open to the house piping, will fall, and the gas in the service will tend to flow in to restore the pressure. To do this the gas must pass into the meter. Assume that the inlet of bellows F is open. The valves and connections are so arranged that when this condition exists the outlet of F and the inlet of space H will be closed, and the outlet of space H will be open. The gas from the service will then, by reason of the reduced pressure in the house piping and in the space H, force its way into the bellows F, expanding it into the space H, and forcing the gas from the space H through its outlet valve into the meter outlet and the house piping. When the bellows F has expanded to its full working length the rods and cranks connecting it to the valve J will have so far moved the



latter that the inlet to the bellows F will close and its outlet open. This change also closes the outlet of space H and opens its inlet. Gas now flows into H, compressing the bellows F, and forcing the gas from it into the house piping. It is clear that at each filling of the bellows F there will be displaced from H and forced into the house piping as much gas as enters F; and that at each emptying of F an equal volume of gas enters H.

Meters are tested for accuracy by passing through them a volume of gas accurately measured in a small gas holder. The law commonly recognizes as accurate a meter that is not more than 1½ per cent. fast or 2 per cent. slow. Gas meters are officially tested at intervals in most localities, and in some states the companies are penalized if the meter be found inaccurate, the penalty varying according to the laws of the different states.

The determining of the light-giving quality of a gas is accomplished by photometry. When gas was first used

for lighting, it was naturally compared with the candle, and the British Board of Trade established a light unit, which has become known as the British standard candle, and a measure of the candle-power of gas. It is a spermaceti candle, 10 inches long and tapering from 8-10 to 9-10 inch diameter, with a cotton wick of 18 strands, adapted to burning 120 grains of wax per hour. In Germany a paraffine candle was adopted as the standard, and in France the Carcel lamp. United States practice tended to the English candle, until improved lamps began to take its place as a standard.

During recent years the Hefner lamp has been widely accepted as giving a much more uniform light for a standard of comparison, though the term candle-power remains in common use. Gas for city lighting in the United States is usually supposed to be maintained at from 16 to 22 candle-power.

The candle-power of a gas-flame is determined by comparison with a standard light. To make this comparison the photometer is employed. A primitive photometer consisted of a sheet of paper partially oiled, which was placed between the standard light and the light to be measured. The oiled portion allowed the light to show through, and thus a location could be found for the paper screen at some point where the light on both sides appeared equal. The relative intensity of the lights was then calculated by the law of inverse squares. In modern practice the screens are improved and specialized. See PHOTOMETER.

GASALIER. See GAS.

GASCOIGNE, *găs-koyn'* GEORGE: 1535–77: b. Westmoreland, England: poet. He was educated at Cambridge, admitted to Gray's Inn 1555, disinherited by his father, and served as a soldier under the Prince of Orange in Holland with some distinction, till captured by the Spaniards at Leyden and sent back to England. He then resumed the dramatic writings that he had begun before his disinheritance. In 1575 he joined the court of Queen Elizabeth, devised a political entertainment for her during her visit to Kenilworth, and greeted her with his *Tale of Hemetes* at Woodstock. The MS. of this, presented to the queen on the following New Year's day, is preserved in the British Museum. In 1576 he published the tragedy, *The Glass of Government*, written 1565, and completed his two most important works, *The Complaint of Philomene* and *The Steel Glass*, on which he had been engaged since 1562, beside publishing *A Delicate Diet for Dainty-Mouthed Drunkards*. His chief dramatic works were a translation of Ariosto's *I Suppositi* —the earliest extant prose play in the English language, utilized by Shakespeare in his *Taming of the Shrew*—and *Jocasta*, the first attempt to naturalize Greek tragedy. Both plays were produced at Gray's Inn 1566. Gascoigne

is considered one of the great pioneers of Elizabethan poetry, the earliest English satirist, and the earliest English critic in poesy.

GASCOIGNE, *găs-koyn′*, Sir WILLIAM: English judge: 1350–1413, Dec. 17; b. Gaythorpe, Yorkshire; of a noble Yorkshire family. After studying for the bar, he acquired reputation as a pleader, and 1398 was made sergeant-at-law. On the accession of Henry IV., 1399, he was appointed one of the justices of the court of common pleas; and 1401, was promoted chief-justice of the king's bench. In the older English law reports are many abstracts of his opinions, arguments, and decisions. In 1403, July, he was joined with the Earl of Westmoreland in a commission for levying forces against the insurrection of Henry Percy, the celebrated Hotspur; he was also one of the commissioners to treat with the rebels. On the apprehension of Scroop, Abp. of York, he refused, at the command of the king, to sentence that prelate to death as a traitor, because the law gave him no jurisdiction over the life of an ecclesiastic: Henry respected his uprightness, and knighted him the same year. When one of the dissolute associates of the Prince of Wales was arraigned before him for felony, the prince imperiously demanded his release, and on being ordered to leave the court, he rushed furiously up to the bench, and, it is recorded, struck the chief-justice on the judgment-seat. Gascoigne immediately committed him to prison, when the prince, sensible of his misconduct, at once submitted. The king, when informed of the facts approved the judge's act. Gascoigne was married twice, and left numerous descendants.

GASCON, n. *găs′kŏn* [from *Gascony*, formerly a dist. in France, the natives of which were great boasters: comp. Gael. *gas ganach*, conceited]: boaster; braggart. GASCONADE, *găs′kŏn-ād′*, boast; bluster; bravado: V. to bluster; to brag ostentatiously. GAS′CONA′DING, imp. GAS′CONA′DED, pp.—The following example of this trait attributed to the people of Gascony, is cited: A Gascon visiting Paris, was asked by a city-friend his opinion of the grand colonnade of the Louvre. His reply was: 'Ah, it's not bad; it resembles quite closely the back part of the stables at my father's castle.'

GASCONADE, *găs-ko-nād′:* river, rising in the s. of Missouri, flowing n.e. 250 m., and joining the river Missouri about 40 m. below Jefferson City. It flows through a hilly country, covered with forests of pine and other timber, and rich in picturesque scenery. Great rafts of yellow pine lumber are floated down the river annually.

GASCONY, *găs′ko-nĭ* (Lat. *Vasconia*): formerly a dist. in s.w. France, between the Bay of Biscay, the River Garonne, and the Western Pyrenees; now included in the depts. of Landes, Gers, Hautes Pyrénées, and the s. portions of Haute Garonne, Tarn-et-Garonne, and Lot-et-Garonne. It derives its name from the Basques or Vasques, who, driven by the Visigoths from their own territories on the s.

slope of the Western Pyrénées, crossed to the n. side of that mountain-range in the middle of the 6th c., and settled in the former Roman dist. of Novempopulana. In 602, after obstinate resistance, the Vasques were forced to submit to the Franks. They passed under the sovreignty of the Dukes of Aquitania, who for a time were independent of the crown; but were afterward conquered by King Pepin, and later by Charlemagne. Later Gascony became incorporated with Aquitania (q.v.).

GASEITY, GASIFY, GAS-HOLDER, etc. See GAS.

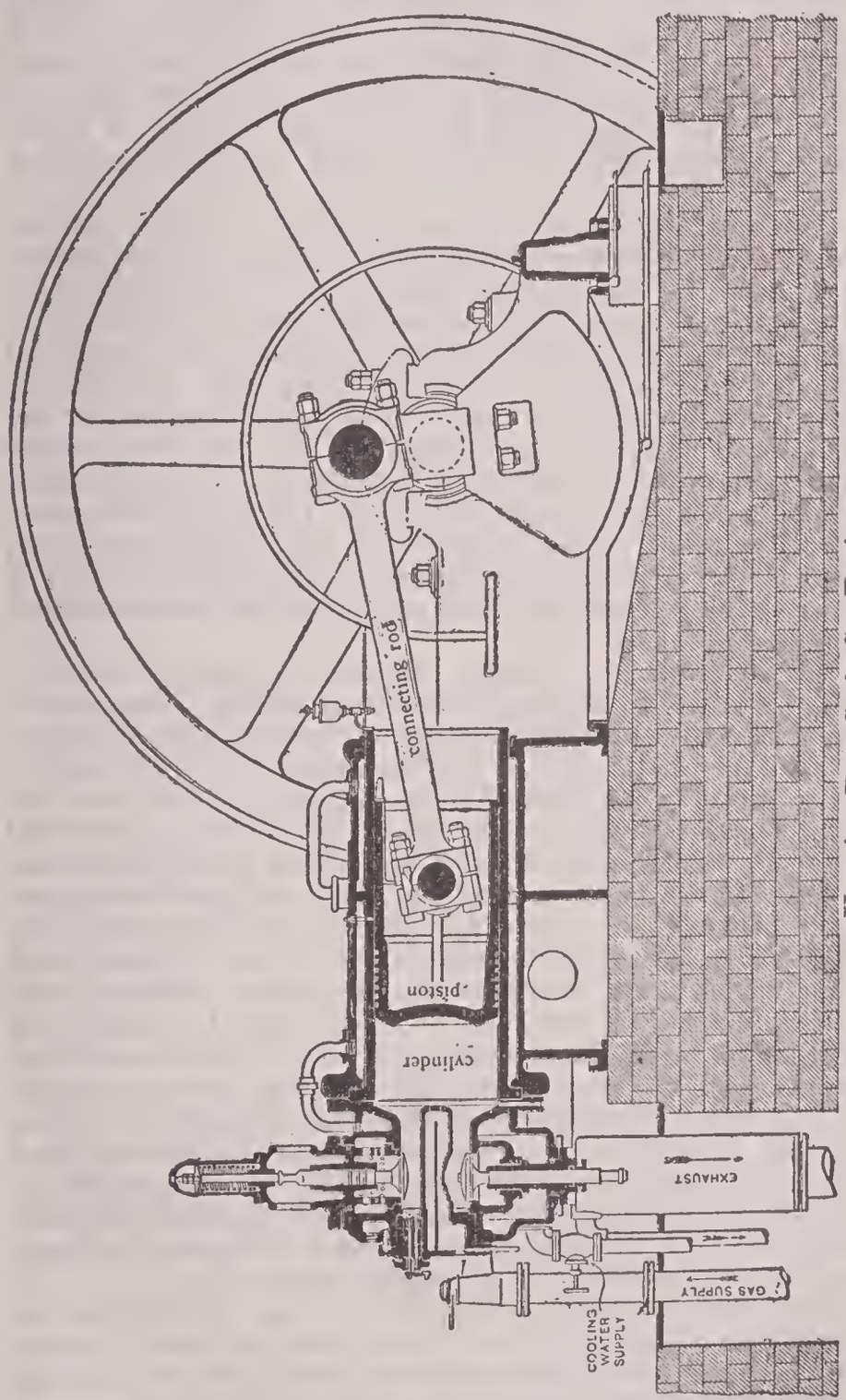
GAS-ENGINE: a machine for furnishing motive power by the expansive force of gas under combustion. The name is loosely applied to motors using any of several gases, but more properly restricted to one consuming some form of gas made from coal, as illuminating or fuel gas, or as derived from a blast furnace. They were at first classed as explosive engines, from the fact that a mixture of the gas and atmospheric air was lit by a flame forming a small explosion, which being confined in a cylinder was used to push a piston and give power, much as does a steam-engine. As now manufactured, however, the operation is one of expansion, as of steam, hence they are not properly termed explosive engines. In operation with ordinary illuminating gas, a mixture of about one part gas to eight parts air is compressed in one end of the cylinder, and a flame or electric spark applied that ignites and expands the mixture so that it gives a pressure, in the common type of engine, of 200 pounds or more to the square inch. This pressure reduces as the cylinder-piston is pushed out, so that the average available pressure is about or nearly 100 pounds.

In the most familiar type of Gas Engines the piston drives only one way in the cylinder, and the gas is expanded at every fourth stroke, this being called a four-cycle engine. Very heavy fly-wheels are required to keep up a uniform motion, as required for driving machinery.

The first practical Gas Engine was the Lenoir, a French invention of 1860. In the following year N. A. Otto produced his first Gas Engine, but it was not until 1878 that he made the four-cycle engine that came into general use. Subsequently a two-cycle Gas Engine was marketed, which ignited and expanded the gas at every second revolution of the fly-wheel. In this, during the back stroke of the piston, the mixture of air and gas was admitted through valves to an auxiliary cylinder, called the compression cylinder. On the out stroke of the piston there is received in the working cylinder a charge of compressed gas from the compression cylinder, which is ignited and expanded, thus pushing the piston and doing work at every stroke. In the Koerting two-cycle Gas Engine a double-ended cylinder is used, and the combustible mixture of gas and air is received at the center of the cylinder. The advantage of the two-cycle Gas Engine is that it permits the use of a fly-wheel much reduced in size.

GAS ENGINE.

For a time the Gas Engine was limited to small sizes. Since 1895 there has been a steady increase. In 1901 the largest one shown at the Pan-American Exposition was of 800 h.p.; in 1904, at the St. Louis Exposition, one of 2,000 h.p. was in operation. Since then



Koerting Four-Cycle Gas Engine.

many still larger have been designed, these being double-acting, that is with compression and expansion taking place on both sides of the piston, which works in a cylinder closed at both ends, whereas, in the single-acting the working cylinder is open at one end.

These very large Engines would be impracticable with ordinary illuminating gas at $1 a thousand feet; but they are made to utilize the waste gases of blast furnaces and coke-ovens, so that the fuel cost is low. They were developed first in Europe, but have been employed in the U. S. since about 1903. The success of large Gas Engines, based on cheap gas, has led to the manufacture of producer gas. In the modern gas-producer, which may be installed and operated as cheaply as a steam boiler, a suitable gas is generated from a great variety of cheap fuel, as coke, lignite, waste tanbark, peat, refuse wood, etc.

Theoretically the combination of the Gas Engine and the gas-producer is more economical for the production of power than even the steam-engine and boiler. A good gas plant will secure 20 per cent. of the heat efficiency of the fuel, and transform it into power, whereas a good steam plant will convert into power only about 12 per cent. of the heat efficiency of the coal. As a consequence the use of the Gas Engine is steadily increasing, and it is used where other sources of power would not be considered. Its advantages as compared with steam power are: (1) Less floor space; (2) absence of smoke, ashes, and dust; (3) safety from explosion; (4) ability to start with little preparation; (5) stoppage of expense and fuel consumption the instant the engine is stopped.

These features, together with pronounced economy as compared with other sources of energy, have made the internal-combustion engine a favorite prime mover in all parts of the world. It has demonstrated its usefulness not only as a stationary engine, but also for the purpose of propelling vehicles of all kinds on land and water. Marine engines have been built up to 200 horse-power, and it is an interesting fact that gasoline-engines have proved to be the only suitable power for operating the submarine torpedo-boats owned by the United States government and the British admiralty. Steam-power has been tried in this class of vessels, but the heat from the boilers made it impossible for men to live in them for any length of time. Not only do the gasoline-engines now in use in these boats obviate this difficulty, but they are also of superior value on account of the limited space needed for machinery and fuel-storage. The manufacture of horseless vehicles for pleasure and business purposes has given a powerful impulse to the development of small gasoline-engines used in propelling motor-cars.

The Diesel engine, an English machine, is designed to use either a gas, an oil or a solid fuel, as coal. In this the air mixed with the fuel is compressed to 500 pounds to the square inch, heating to 1,000° F. temperature. It is built both as a two-cycle and four-cycle engine.

Gas Engines are classed by the census as internal-combustion engines, with those that use gasoline or some form of oil as a fuel. See ENGINE and GASOLINE-ENGINE.

GASES, ANALYSIS OF: department of analysis originat-

ing in the attempts of various chemists, during the last quarter of the 18th, and the first quarter of the 19th c., to determine the volume of oxygen in specimens of atmospheric air taken from different localities. The general principle on which the early eudiometers (q.v.) were constructed, was that of exposing atmospheric air to the action of some substance which combined with its oxygen. Various eudiometers and eudiometrical processes were devised by Priestley, De Marté, Guyton, Seguin, Volta, Berthollet, Hope, Henry, Pepys, Ure, etc., which are now of interest in only a historical view. They were not only almost exclusively limited to the determination of the quantity of oxygen, but they were more or less imperfect in their action; and the analysis of the gases generally did not become developed into a system until Prof. Bunsen of Heidelberg, began to investigate the subject.

The methods employed in the analysis of gases may be divided into three general classes: (1) Those based on diffusion; (2) those based upon the absorption of certain constituents by substances over or through which the mixed gases are passed; and (3) those in which the given mixture is oxidized, and its original composition inferred from an examination of the products of the oxidation. In the application of diffusion methods, the mixture is caused to pass through a porous septum of graphite, gypsum, or baked clay. The lighter constituents pass through faster than the heavier ones, so that a partial separation is effected. By causing the mixture to pass through a succession of such porous partitions, the concentration effects may be correspondingly increased. This method has been employed in many chemical researches, especially for effecting the concentration of gaseous substances that are present in a mixture in very small quantity. Its value as an experimental method was well demonstrated in connection with the study of the rare gases of the atmosphere, in effecting the separation of helium from argon. In general, the rates of diffusion of two gases are proportional to the square roots of their densities and the density of argon being 10 times that of helium, it follows that helium will diffuse through a porous septum about 3.2 times as fast as argon.

In the analysis of gases by the absorption of certain of their constituents by means of chemical substances, use is made of the following facts (among others): Water absorbs HCl, HBr, and HI, very readily; solid caustic potash, when moist, absorbs all acid gases, such as CO_2, SO_2, H_2S, HCl, etc.; dilute sulphuric acid absorbs all alkaline gases, such as ammonia; concentrated sulphuric acid also absorbs water, alcohol, ether, methyl oxid, and (more slowly) propylene and its homologues; alkaline solutions of pyrogallic acid absorb oxygen very readily; cuprous chlorid in solution in hydrochloric acid absorbs oxygen and carbon monoxid; and solutions of CrO_3 and of $KMnO_4$ absorb H_2S and SO_2. In the study of special problems, certain unusual absorbents also suggest them-

selves. Thus in the isolation of the rare gases of the atmosphere, great use was made of the fact that red-hot metallic magnesium absorbs nitrogen gas, while it is without effect upon argon, helium, and the other gases of that group.

The combustion methods are particularly applicable to those cases in which the mixture to be analyzed is capable of being burned so that the final products are water, carbon dioxid, and free nitrogen, together with excess of such gas as may have been added in order to effect the combustion. The combustion is effected in an instrument called a eudiometer, which commonly consists of a graduated glass tube that is closed at the upper end, and which is provided with a pair of platinum electrodes fused through the glass near the closed end. A sample of the gas to be analyzed is introduced into the tube (the lower end of which dips into a mercury bath), and its volume is determined by reference to the graduation marks, readings being simultaneously taken of the thermometer and barometer, so that the observed volume of the gas can be reduced, in the subsequent calculations, to standard conditions of temperature and pressure. A known quantity of such gas as may be required to effect the combustion is next added, pure oxygen being used if the gas under examination is rich in carbon and hydrogen, and pure hydrogen being used if it is highly oxygenated or chlorinated. It is usual, also, to add a known quantity of fulminated gas, which is prepared by the electrolysis of water, and consists of pure oxygen and hydrogen, in the proportion in which they combine to form water. The mixture is then exploded by passing an electric spark between the electrodes that are sealed into the eudiometer near its closed end, and after the heat developed by the explosive combustion has been lost by radiation, the volume of the mixture is again determined. The several constituents that remain in the eudiometer tube are then removed, one by one, by the temporary introduction, into the tube, of suitable absorbent substances. The volume of the gaseous contents of the eudiometer tube are observed after each partial absorption, and from the data so obtained the quantities of carbon, oxygen, hydrogen, and nitrogen that were present in the original sample may be calculated. Consult: Hempel, *Methods of Gas Analysis;* Sutton, *A Systematic Handbook of Volumetric Analysis.*

GASES, General Properties of: physical characteristics of aëriform fluids. The term gas from the same root as ghost, Ger. *geist,* breath, spirit—was used by the older chemists to designate any kind of air or vapor. Van Helmont was the first chemist who limited the term gas to such elastic fluids as had not been rendered liquid or solid by a reduction of temperature. In common language a distinction is made between gases and vapors. Gases are understood to be invariably aëriform at ordinary temperatures and atmospheric pressures, while vapors under these conditions are solid or liquid, and assume a vaporous or apparently gaseous form only at relatively high temperatures. Thus oxygen, hydrogen, nitrogen, chlorine, etc., are considered true gases; while water, sulphur, iodine, etc., when heated to certain definite points, become transformed into vapors. The above is a general statement, as variations in the application of the term 'vapor' will be found in different books,

The *kinetic theory of gases,* put forth first by Daniel Bernouilli, is to the effect that they are formed of material particles, free in space, and actuated by very rapid rectilinear movements; and that the tension of elastic fluids results from the shock of their particles against the sides of the containing vessels. This theory has been recently revived and developed chiefly by Glausius and Clerk Maxwell. The perfect elasticity of gases is one of their most important physical peculiarities. Within the limits of all ordinary experiments it is generally true that 'the volume of a gaseous body is inversely as the compressing force:' see Mariotte's Law. In consequence of their extreme elasticity, gases exhibit entire absence of cohesion among their particles, and in this respect they differ essentially from liquids. A vessel may be filled either partially or completely with a liquid, and this liquid will have a definite level surface or limit. With gases, it is otherwise; they always perfectly fill the vessel, that contains them, however irregular its form. Instead of cohesion, there is a mutual repulsion among their particles, which have a continual tendency to recede further from each other, and thus exert a pressure in an outward direction upon the sides of the vessel in which the gas is inclosed. This outward pressure is greater or less according as the elasticity of the gas is increased or diminished.

Dalton long ago remarked that 'there can scarcely be a doubt entertained respecting the reducibility of all elastic fluids, of whatever kind, into liquids; and we ought not to despair of effecting it at low temperatures and by strong pressure exerted upon the unmixed gases.' This prediction has been fulfilled. It occurred to Faraday, who led in these investigations, that the most probable mode of obtaining gases (or rather what, under ordinary circumstances, would be gases) in the liquid state, would be to generate them under strong pressure. When thus produced in strong bent glass tubes, they continued liquid at low temperatures while the pressure was maintained; but on removing the pressure (breaking the tube), they instant-

ly passed into the gaseous state. In his memoir (*Philosophical Transactions*, 1823), he announced that he had succeeded in liquefying chlorine, euchlorine, sulphuretted hydrogen, nitrous oxide, cyanogen, ammonia, and hydrochloric, sulphurous, and carbonic acids. Since his time by the joint action of powerful mechanical pressure and extreme cold, the number of liquefiable gases has been so far extended as to include all, oxygen, hydrogen, and nitrogen, being the last of the elemental gases to succumb.

The researches of Andrews established the fact that for every gas there is a certain minimum temperature at which the energy of the molecular movement is exactly balanced by the force of cohesion, *whatever be the pressure to which the vapor is subjected;* this temperature is the 'critical point' of the gas. It was because the critical points of certain gases are very low that they so long resisted all efforts to condense them. No amount of pressure without the necessary cold could be effectual. At last, in the end of 1877, by the use of powerful apparatus and ingenious contrivances for producing cold, the difficulties have been overcome by MM. Cailletet and Raoul Pictet of Geneva. By combining a cold of 120° to 140° below zero, with enormous pressures of 550 and even 650 atmospheres, M. Pictet was able to liquefy oxygen. 'He has also liquefied and even solidified hydrogen, which he has seen to issue from the tube in the form of a steel-blue liquid jet, which partly solidified. The solid hydrogen, in falling on the floor, produced the shrill noise of a metallic hail, thus confirming the bold and ingenious idea of Faraday, who first suggested that hydrogen is a metal.' The distinction between permanent and condensable gases is thus abolished. It is of historical interest to note that many years before the publication of Faraday's earliest researches on this subject, sulphurous acid gas had been liquefied by Monge and Clouet, ammonia by Guyton Morveau, and arseniuretted hydrogen by Stromeyer, by the simple application of cold, without increased pressure.

For the expansion and contraction of gases by changes of temperature, see HEAT.

The process of intermixture in gases, and the movements of these substances generally have been very carefully studied by Faraday, Döbereiner, Mitchell, Bunsen, and especially Graham. These movements are considered usually under four heads, viz.: 1. *Diffusion*, or the intermixture of one gas with another; 2. *Effusion*, or the escape of a gas through a minute aperture in a thin plate into a vacuum; 3. *Transpiration*, or the passage of different gases through long capillary tubes into a rarefied atmosphere; 4. *Osmosis*, or the passage of gases through diaphragms.

For the general principles of diffusion in gases, see DIFFUSION: some supplementary remarks follow, chiefly with the view of rendering the following table more intelligible. Graham's experiments with the simple diffusion-tube show (see Graham's Memoirs. *Transactions of the Royal Societies of London and Edinburgh;* or Miller's *Chemical Physics*) that the diffusiveness or *diffusion volume* of a

gas is in the inverse ratio of the sq. root of its density; consequently, the squares of the times of equal diffusion of the different gases are in the ratio of their specific gravities. Thus, the density of air being taken as the standard of comparison at 1, the sq. root of that density is 1, and its diffusion volume is also 1; the density of hydrogen is 0·0692, the sq. root of that density is 0·2632, and its diffusion volume is $\frac{1}{0\cdot2632}$, or 3·7994; or, as actual experiment shows, 3·83—that is to say, if hydrogen and common air be placed under circumstances favoring their mutual diffusion, 3·83 volumes of hydrogen will change place with 1·00 of air. The following table gives; 1. The density 2. The sq. root of the density; 3. The calculated, and 4 The observed velocity of diffusion or diffusiveness of several important gases; the numbers in the last column, headed 'Rate of Effusion,' being the results obtained by experiment upon the rapidity with which the different gases escape into a vacuum through a minute aperture in a thin plate which aperture was about $\frac{1}{300}$ of an inch in

Gas.	Density.	Square Root of Density.	Calculated Velocity of Diffusion.	Observed Velocity of Diffusion. Air = 1.	Rate of Effusion.
Hydrogen	0·06926	0·2632	3·7994	3·83	3·613
Light Carburet'd Hydro'n.	0·559	0·7476	1·3375	1·344	1·322
Carbonic Oxide	0·9678	0·9837	1·0165	1·0149	1·0123
Nitrogen	0·9713	0·9859	1·0147	1·0143	1·0164
Olefiant Gas	0·978	0·9889	1 0112	1·0191	1·0128
Binoxide of Nitrogen	1·039	1·0196	0·9808		
Oxygen	1·1056	1·0515	0·9510	0·9487	0·950
Sulphuretted Hydrogen	1·1912	1·0914	0·9162	0·95	
Protoxide of Nitrogen	1·527	1·2357	0·8092	0·82	0·834
Carbonic Acid	1·52901	1·2365	0·8087	0·812	0·821
Sulphurous Acid	2·247	1·4991	0·6671	0·68	

diameter. 'The process of diffusion,' says Prof. Miller, 'is one which is continually performing an important part in the atmosphere around us. Accumulations of gases which are unfit for the support of animal and vegetable life are by its means silently and speedily dispersed, and this process thereby contributes largely to maintain that uniformity in the composition of the aërial ocean which is so essential to the comfort and health of the animal creation. Respiration itself, but for the process of diffusion, would fail of its appointed end in rapidly renewing to the lungs a fresh supply of air in place of that which has been rendered unfit for the support of life by the chemical changes which it has undergone.' A reference to the last two columns of the above table shows that, within the limits of experimental errors, the rate of effusion of each gas coincides with its rate of diffusion.

Graham's experiments show that the velocity of *transpiration* (the term which that chemist applied to the passage of gas through long capillary tubes) is entirely independent of the rate of diffusion, or of any other known

property. It varies with the chemical nature of the gas, and is probably 'the resultant of a kind of elasticity depending upon the absolute quantity of heat, latent as well as sensible, which different gases contain under the same volume; and therefore will be found to be connected more immediately with the specific heat than with any other property of gases.' Oxygen is found to have the lowest rate of transpiration. Taking its transpiration velocity at 1, that of air is 1·1074; of nitrogen, 1·141; of carbonic acid, 1·369; of sulphuretted hydrogen, 1·614; of ammonia, 1·935; of olefiant gas, 1·980; and of hydrogen, 2·288.

In Osmosis, or the passage of gases through diaphragms, the law of the diffusion of gases is more or less disturbed or modified according to the force of adhesion in the material of which the diaphragm is composed; the disturbance being greatest in the case of soluble gases and a moist thin diaphragm such as a bladder or a rabbit's stomach: for details, see Osmose.

All gases are more or less soluble in water and other liquids. Some gases, e.g. hydrochloric acid and ammonia, are absorbed by water very rapidly, and to a great extent, the liquid taking up 400 or 600 times its bulk of the gas; in other cases, as carbonic acid, water takes up its own volume of the gas; while in the case of nitrogen, oxygen, and hydrogen, it takes up not more than from $\frac{1}{25}$ to $\frac{1}{50}$ of its bulk. 'As the elasticity of the gas,' says Prof. Miller, 'is the power which is here opposed to adhesion, and which at length limits the quantity dissolved, it is found that the solubility of each gas is greater, the lower the temperature, and the greater the pressure exerted upon the surface of the liquid. Dr. Henry found that at any given temperature the *volume* of any gas which was absorbed was uniform, whatever might be the pressure; consequently, that the *weight* of any given gas absorbed by a given volume of any liquid at a fixed temperature, increased directly with the pressure. If the pressure be uniform, the quantity of any given gas absorbed by a given liquid is also uniform for each temperature; and the numerical expression of the solubility of each gas in such liquids, is termed its *coefficient of absorption* or *of solubility*. at the particular temperature and pressure, the volume of the gas absorbed being in all cases calculated for 32° F., under a pressure of 29·92 inches of mercury. Thus, 1 volume of water at 32°, under a pressure of 29·92 inches of the barometer, dissolves 0·04114 of its volume of oxygen; and this fraction represents the coefficient of absorption of oxygen at that temperature and pressure. Similarly, the coefficient of absorption of common air is 0·02471. In consequence of this solubility of the air, all water contains a certain small proportion of it in solution; and if placed in a vessel under the air-pump, so as to remove the atmospheric pressure from its surface, the dissolved gases rise in minute bubbles. Small as is the quantity of oxygen thus taken up by water from the atmosphere, it is the means of maintaining the life of all aquatic animals. If the air is expelled from water by boiling, and it be covered with a

layer of oil, to prevent it from again absorbing air, fish or any aquatic animals placed in such water quickly perish. Even the life of the superior animals is dependent on the solubility of oxygen in the fluid which moistens the air-tubes of the lungs, in consequence of which this gas is absorbed into the mass of the blood, and circulates through the pulmonary vessels.'

The following table, drawn from the researches of Bunsen and Carius, shows the solubility of some of the most important gases, both in water and in alcohol:

Gas.	Volume of each Gas dissolved in 1 Volume of Water.		Volume of each Gas dissolved in 1 Volume of Alcohol.	
	At 32 Degrees F.	At 59 Degrees F.	At 32 Degrees F.	At 59 Degrees F.
Ammonia	1049·60	727·2		
Hydrochloric Acid	505·9	458·0		
Sulphurous Acid	68·861	43·564	328·62	144·55
Sulphuret'd Hydro'n	4·3706	3·2326	17·181	9·539
Chlorine	Solid	2·368		
Carbonic Acid	1·7967	1·002	4·3295	3·1993
Protoxide of Nitro'n.	1·3052	0·0778	4·1780	3·2678
Olefiant Gas	0 2563	0·1615	3·5950	2·8825
Binoxide of Nitrogen			0·31606	0·27478
Marsh Gas	0·05449	0·03909	0·52259	0·48280
Carbonic Oxide	0·03287	0·02432	0·20443	0·20443
Oxygen	0·04114	0·02989	0 28397	0·28397
Nitrogen	0·02035	0·01478	0·12634	0·12142
Air	0·02471	0·01795		
Hydrogen	0·01939	0·01930	0·06925	0·06725

All these gases, with the exception of hydrochloric acid, may be expelled from the water by long-continued boiling. Gases are not absorbed by all liquids in the same order; e.g., naphtha absorbs most olefiant gas, oil of lavender most protoxide of nitrogen, olive oil most carbonic acid, and solution of chloride of potassium most carbonic oxide. If a mixture of two or more gases be agitated with water, or probably any other liquid, a portion of each gas will be absorbed, and the amount of each so absorbed or dissolved will be proportional to the relative volume of each gas multiplied with its coefficient of solubility at the observed temperature and pressure. As all ordinary liquids exert a greater or less solvent action on gases, a gas that we wish to examine quantitatively should be collected over mercury.

The adhesion of gases to solids next requires notice. Illustrations of this phenomenon perpetually occur. Thus, wood and other solid substances immersed in water or other liquids appear covered with air-bubbles. It is this adhesion of air to the surface of glass tubes which causes the difficulty of obtaining barometers and thermometers completely free from air. It is in consequence of the adhesion of air to their surfaces that many small insects are enabled to skim lightly over the surface of water which does not wet them. A simple method of illustrating this phenomenon is by gently dusting iron filings over the surface of a vessel of water; if we proceed carefully, a considerable

mass of the iron may accumulate upon the surface; till, at last, it falls in large flakes, carrying down with it numerous bubbles of air. As the particles of iron are nearly eight times as heavy as water, it was only the adherent air that enabled them to float upon the surface by permitting surface tension to act. Closely allied to this adhesion is the remarkable property of condensation which porous bodies, especially charcoal, exert on gases. Owing to this property of charcoal—especially freshly burned vegetable charcoal—various gases may be separated from their watery solution by filtration of the latter through it; e.g., sulphuretted hydrogen may be removed from water so completely that it cannot be detected either by its well-known odor or by the ordinary tests. Saussure found that 1 volume of freshly burned box-wood charcoal absorbed 90 volumes of ammonia, 85 of hydrochloric acid, 65 of sulphurous acid, 55 of sulphuretted hydrogen, 40 of protoxide of nitrogen, 35 of carbonic acid, 35 of bi-carburetted hydrogen, 9·4 of carbonic oxide, 9·2 of oxygen, 7·5 of nitrogen, 5 0 of carburetted hydrogen, and 1·7 of hydrogen. These results follow an order very nearly the same as that of the solubility of the gases in water. Stenhouse has investigated the differences in the absorbent power of different kinds of charcoal; the following are his most important results: 0·5 of a gramme of each kind of charcoal being employed, and the numbers in the table indicating in cubic centimetres the quantity of absorbed gas.

Gas Used.	Kind of Charcoal employed.		
	Wood.	Peat.	Animal.
Ammonia	98·5	96·0	43 5
Hydrochloric Acid	45·0	60·0	
Sulphurous Acid	32·5	27·5	17·5
Sulphuretted Hydrogen	30·0	28·5	9·0
Carbonic Acid	14·0	10·0	5·0
Oxygen	0·8	0·6	0·5

So rapid is this action of charcoal, that Stenhouse has proposed to use a respirator filled with it to protect the mouth and nostrils in an affected atmosphere; and the employment of trays of powdered wood-charcoal in dissecting-rooms, in the wards of hospitals, and in situations where putrescent animal matter is present, is found to act very beneficially in purifying the air by absorbing the offensive gases. Its use in the filtration of water has been already alluded to.

The determination of the exact specific gravity of the different gases is of great importance in calculating the proportions of the different ingredients of compounds into which they enter; and the whole series of numbers expressing the chemical equivalents or atomic weights of bodies depend upon the accuracy of the determination of the specific gravity of hydrogen and oxygen.

The following table gives the specific gravity and the weight of 100 cubic inches of some of the most important gases at a barometric pressure of 30 inches, and at a temperature of 60°, together with the name of the observer:

Gas.	Specific Gravity. Air = 1.	Weight of 100 Cubic Inches in Grains.	Observer.
Air	1·0000	30·935	Regnault.
Oxygen	1·1056	34·203	"
Nitrogen	0·9713	30·119	"
Hydrogen	0·0692	2·143	"
Carbonic Acid	1·5290	47·303	"
Chlorine	2·5000	76·250	Thomson.
Ammonia	0·5902	18·003	"
Caburetted Hydrogen	0·5555	16·944	"
Olefiant Gas	0·9722	29·652	"
Arseniuretted Hydrogen	0·5290	16·130	Tromsdorff.
Sulphuretted Hydrogen	1·1805	36·007	Thomson.
Cyanogen	1·8055	55·069	Gay Lussac.
Hydrochloric Acid	1·2847	39·183	Thomson.
Sulphurous Acid	2·2222	67·777	"

For the methods of determining the specific gravity of a gas, both by direct observation and by calculation, see Specific Gravity.

As to the chemical properties of gases, most of the different gases, when pure, can be readily distinguished by some well-marked physical or chemical property. Some are distinguished by their color, others by the peculiar odor; but several of the most important—viz., oxygen, nitrogen, hydrogen, carbonic acid, carbonic oxide, light carburetted hydrogen, olefiant gas, and protoxide of nitrogen—require other means for their discrimination. For the distinctive characters of the most important gases, see Oxygen: Hydrogen· Chlorine: etc.: for the outlines of the general method of analyzing a gaseous mixture, see Gases, Analysis of. For further details on the physical and chemical characters of the gases, see Miller's *Elements of Chemistry*, especially the vol. on *Chemical Physics* (freely used in this article); to Kekule's *Lehrbuch der Organischen Chemie*, 1859; and to Roscoe's translation of Bunsen's *Gasometry*.

GASH, n. *găsh* [OF. *garser*, to scarify with a lancet—from mid. L. *garsa*, scarification of the flesh: Gael. *gaise*, an injury with a sharp weapon: Low Ger. *gatsken*, to cut a large hole]: a deep long cut; a deep irregular wound from a slash: V. to cut deeply. Gash'ing, imp. Gashed, pp. *găsht*.

GASH, v. *găsh* [F. *gausser*, to mock, to banter: Gael. *gaish*, a torrent]: in *Scot.*, to talk freely and fluently; to talk pertly or insolently: Adj. lively and fluent in discourse; sagacious. Gash'ing, imp. Gashed, pp. *găsht*.

GASIFY, etc.: see Gas.

GASKELL, *găs'kel*, Elizabeth C.: English authoress; 1810,Sep.–1865,Nov. (maiden name, Stevenson); wife of a Unitarian clergyman in Manchester. Her novels, of which

Mary Barton (1848) and *Ruth* (1853) are perhaps the best examples, are chiefly descriptive of the habits, thoughts, privations, and struggles of the industrial poor, in such a social bee-hive as the city of her residence. Some of her characters are drawn with remarkable dramatic power, and many of her descriptive passages are very graphic. Among her works are *The Moorland Cottage* (1850), a Christmas Story; *North and South* (1855); *Cranford;* and *Lizzie Leigh* —the last three of which originally appeared in *Household Words.* Mrs. Gaskell also edited a very interesting life of Charlotte Brontë (q.v.), 1857. Among her later works were *Sylvia's Lovers* and *Cousin Phyllis.*

GASKET, n. *găs'kĕt* [F. *garcette,* a gasket—from Sp. *garceta*]: plaited hemp used for packing pistons, etc.; plaited cords or small ropes by which the sails when furled are kept bound up close to the yards or gaffs.

GASKINS: contracted form of GALLIGASKINS (q.v.).

GAS, NATURAL: natural gas, whose extensive exploitation in the United States since 1884 reads like a fairy tale has been known for centuries. The Chinese brine-wells deliver a certain quantity of gas, which has for a long period been used to assist in evaporating the liquid in the manufacture of salt. More or less has been known also in this country for many years. In 1884 the gas found by explorers for oil in western Penn. and in Ohio began to attract attention, and in 1885 when gas was found in still greater quantities the excitement grew intense. Its economic possibilities were at last realized, and now wells have been drilled in nearly every state and territory of the United States, for the purpose of finding natural gas. As a result of this prospecting it has been found that gas exists in greater or less quantity over most of this country. Along the coast e. of the Appalachian chain no gas, or very little, is found. The greatest quantities are in the Mississippi valley e. of the river. N. Y., Penn., Ohio, and Ind. are the principal producing states. It has been found generally in the Trenton limestones of Ohio, and in the upper coal measures of Penn., also in all formations from the Potsdam to the Drift. The origin is unknown; geologists have not even determined whether it has been long generated, or whether it is still in course of formation.

To exploit a gas-field, wells are drilled exactly as if for oil or water. When the gas is struck the tremendous pressure frequently blows out everything from the bore of the well, and the gas rushes out often at a pressure of 500 lbs. or more to the sq. inch. The well is connected to a gas main and part or all of the supply is carried off to the point of consumption. Up to 16 inches in diameter, wrought-iron pipes are the rule; for larger sizes cast-iron is usually employed. The immense pressure available has made it possible to carry the gas long distances, 50 or 100 m. is easily compassed. The pressure also causes leakage, which is coped with in different ways. In the Westinghouse system a conical pile of loose stone is used to cover each

joint, which pile is enveloped in thick-tarred paper. A trumpet-mouthed pipe is connected to the apex of this cone, which carries away any gas which escapes and which is burned at intervals of about one hundred yards at lamp-posts. This somewhat crude system is used on the smaller mains: for the large cast-iron pipes a metallic casing for each joint is provided. Into this casing a small pipe is tapped which delivers the leakage to a two-inch subsidiary main. The leakage gas is carried to lamp-post burners at about the same interval as mentioned above. A vertical pipe with a cap screwed on rises from each casing near the surface. By unscrewing the cap it can be ascertained whether the joint leaks badly. If it does it can generally be made tight by pumping a fluid asphaltum compound into it, replacing the cap, and allowing it to stand a few days. The fluid penetrates the cracks and after the casing is pumped out the joint is practically tight. A heap of stones with tarred paper wrapping and escape-pipe covers the casings also, to provide for low-pressure leakages from them. Governors of proper construction are used to reduce the pressure to a manageable point.

Natural gas varies widely in composition and properties. Its illuminating power is generally low, and its calorific value is inferior to that of coal gas. Its industrial applications are very numerous and great. In regions where it can be had it displaces coal for steam-boilers, iron and glass works, and other factories, as well as for domestic uses. A peculiar system of charging has been adopted. As the gas costs nothing, no attempt is made to measure it, but the consumer is charged for the uses that he makes of it. Thus the following are among the rates which were charged at Pittsburgh: Puddling iron per ton of product, $1.00; steam boilers, per month, $50—$100; flint glass, for each 10-pot furnace, per month, $160; domestic use, open grate, $2 per month. This system of charging has brought about an enormous waste, and it has been a matter of serious consideration whether it should not be sold by the 1,000 cubic ft. The economy in some of its industrial uses is estimated as not far from 50 per cent. It is computed that over $3 can be saved in producing one ton of bar iron. Glass made in gas heated furnaces is superior in quality also. For domestic purposes little if any direct economy is effected, but the absence of ashes and smoke makes it the ideal fuel. Both in the factory and in the house labor is saved by it. The smoky atmosphere of metallurgical centres is abolished, in itself a great amelioration.

There have been at one time over 1,500 natural-gas companies in this country, operating 12,000 wells, and owning some 25,000 miles of pipe. By this, fuel was supplied to over 700,000 domestic fires, hundreds of iron mills, glass works and other industrial establishments. Many of the natural-gas fields have become exhausted, especially in n.w. Ohio and around Pittsburg. From the deep sand reservoirs of s.w. and cen. Pennsylvania, and

West Virginia the chief supply of natural gas now comes. But unless virgin fields are discovered, it will be impossible to continue the present enormous supply indefinitely.

GASOLENE, *găs′ō-lēn,* or GASOLINE: liquid obtained from the distillation of crude naphtha—a product of the distillation of petroleum; used for illuminating purposes. It is the most volatile product of petroleum, highly inflammable and explosive; hence it is said to be impossible to make it safe to burn in the form of oil. It is used largely for making air-gas. See PETROLEUM.

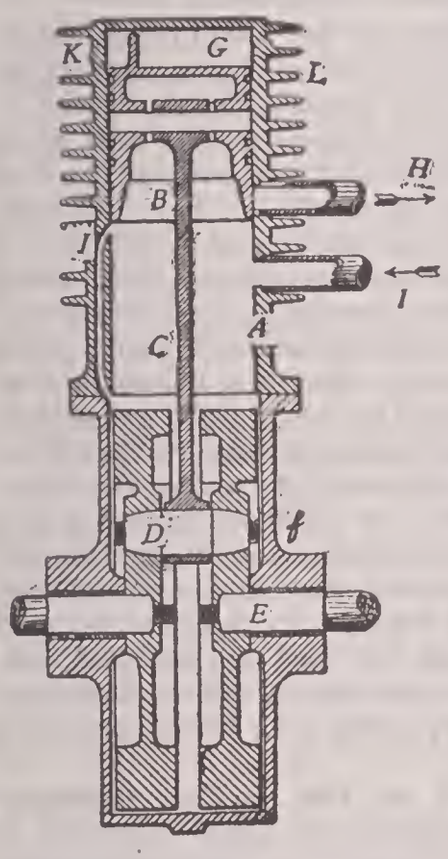
GASOLINE-ENGINE or MOTOR: a type of internal-combustion engine for producing power. It converts sprayed gasoline into vapor, mixes the vapor with slightly compressed air, and ignites the mixture in the closed end of a cylinder, pushing a piston and discharging the spent gases from the open end of the cylinder. As a stationary engine the construction is very similar to that of the gas-engine (q.v.), but for use on automobiles the G.-E. has been highly specialized. The heavy fly-wheel was reduced; a small piston working at high speed was found better than the large, slow-moving piston; graduating the charges of vapor proved an advantage in reducing vibrations; and in many cases two, three, four or more cylinders were connected to one crank-shaft, and operated as one engine, being timed to work in rotation. Four-cylinder engines are perhaps the most favored.

The first step is the vaporizing of the gasoline. This is done with a carbureter, the spray type being most common. The gasoline is contained in a tank, from the bottom of which it is led by gravity through a tube that ends in a fuel-nozzle projecting into an air-pipe. A current of air sent through this pipe sucks out the gasoline in a spray, after the manner of an atomizer. This spray is sent at regular intervals to the charging port of the engine cylinder.

In the two-cycle form of engine shown in the illustration A is the cylinder through which moves the piston B, driving the connecting-rod C, and the crank D on the crank-shaft E. The casing is marked F, the explosion chamber G. The inlet port is at I, and the exhaust at H. The sprayed gasoline fuel enters at the port J, is pushed up by the piston, and deflected by the plate at the right of K. to the explosion chamber. An electric spark is usually introduced to fire the mixture of air and vapor, causing the explosion (which is more correctly an expansion), and pushing down the piston, thus operating the crank-shaft. The flanges at L are for increasing the cooling surface of the cylinder, which depends on the surrounding air for keeping down its temperature. Various arrangements of flanges or pins are used to increase the radiating surface of the cylinders, this being necessary to dissipate the heat that is generated very rapidly by the explosions and compression of the air within the cylinder. Water jackets are often provided for cooling the cylinder, the water being circulated in a nest of tubes to keep it cool.

To prevent the unpleasant noise of the exhaust gases escaping from the cylinder, a muffler is used, one form being a flaring tube, into the small end of which the exhaust enters, drawing through small holes at the side additions of cool air, which so reduce the heat that there is slight noise when it escapes at the large end. A more common form provides chambers in which the exhaust circulates, expands and cools before escape. An efficient muffler consists simply of a series of parallel plates set edgewise to the floor of the exhaust, and enclosed in a box.

The mechanisms for operating the valves or ports of a Gasoline Engine are usually cams timed to open and close them at the correct instant. Inlet valves often operate automatically, opening by the back suction of the piston, and closing with a spring. All the valves are best provided with a spring for quick closing.



The ignition system of a Gasoline Engine may be either electric or flame, or hot tube. The latter two are better suited to stationary engines than to automobile use. In automobile practice ignition of the gasoline vapor by the electric spark is almost universal. The jump-spark ignition, which is common, employs a dry battery as a source of current, an induction coil, and primary and secondary wire circuits. In the former is a contact-breaker which connects and disconnects the circuit according to the timing of its movement. In the secondary circuit is a spark plug with sparking points separated by a minute gap. When the current is allowed to pass the contact-breaker it jumps the gap with a spark, and this spark is made at the correct instant to ignite the charge of gasoline vapor and air in the explosion chamber of the Gosoline Engine. Magneto ignition is also common; see AUTOMOBILE.

GASOMETER, etc.: see GAS: GAS, LIGHTING BY.

GASP, n. *găsp* [Icel. *geispa*, to yawn: Dan. *gispe;* Sw. *gaspa*, to gasp]: the short convulsive opening of the mouth for breath when not able to breath freely; the short sharp catching of the breath in agony or in dying: V. to breathe with difficulty by short inspirations. GASP'ING, imp.: ADJ. opening the mouth to catch breath: N. act of opening the mouth to catch breath; the short catch of breath in agony or in dying. GASPED, pp. *găspt.*

GASPÉ, *gâs-pā′:* most easterly district of Lower Canada, consisting of the counties of Gaspé and Bonaventure; chiefly a peninsula projecting into the Gulf of St. Lawrence, between the estuary of the same name on the north and the Bay of Chaleur on the south. It is n. lat. 48°—49° 20′, and in w. long. 64° 15′—67° 56′; 7,500 sq. m. Cod and whale fishing are the staple business of the country. The pop., mostly of French descent, about 30,000.

GASPÉ BASIN, is a prosperous and rising village on the bay of Gaspé, with a safe and splendid harbor. It was constituted a free port 1860, and gives promise of becoming an important trading centre. Pop. about 700.

GAS PRODUCER: a machine for producing cheap gas for power, fuel, etc. It is to the large modern gas-engine what the boiler is to the steam-engine. It is installed and operated as readily as a steam-boiler, and when of large size, operating on suitable fuels, it reduces the fuel cost for the amount of power developed. The fuel consumption of a Gas Producer and gas-engine plant should not be over 1¼ to 1½ pounds of coal per horse-power hour, or about a half to a third of an average steam-boiler plant. A Gas Producer operates on principles similar to a plant making water-gas, but is usually very much less in size, being designed simply to serve the wants of a gas-engine plant. For plants of 75 h. p. and over, the pressure producer is adapted. This consists of a blower, generator, scrubber, (or purifier), a sawdust purifier, an economizer and a gas-holder. The blower supplies a pressure for forcing air and steam from a small auxilliary boiler into the generator, and overcoming the resistance of the gas in passing through the various apparatus. Almost any fuel can be used, and the waste of lumber mills, furniture factories, burnable trash from city refuse, lignite, peat, etc., have been utilized.

In small plants, operated on the suction principle, it is best to use anthracite coal. A slight vacuum is maintained in the apparatus to force the combustible mixture of gas and air into the gas-engine, doing away with the blower required in large plants. The generator used is a steel shell, superficially resembling a boiler, but lined with fire brick. There is a fire-grate at the bottom, and an air-lock at the top through which the coal is supplied. The fire gasifies the coal in the generator, and the engine at each stroke produces a suction that draws off a portion of this gas to the evaporator. Here the necessary steam is generated, and the gas cooled by passing down through tubes immersed in the water that is to make steam. The gas gives up heat to the water and thus advances steam-making. The steam and air, mixed and led through the bed of burning fuel, greatly increase the volume of gas made from the coal, as in the manufacture of water-gas. (See GAS). After passing the vaporizer, the gas goes to a scrubber, which is a purifying mechanism for removing ammonia, tar, sulphur, etc. If anthracite coal, charcoal or coke is the fuel used, this purification is sufficient, but

with bituminous coal a sawdust purifier is best added, in which any remaining tar, moisture or dust that has passed the scrubber may be removed by passing through beds of sawdust. Such a suction plant has to be started with a small hand blower, until the gas-engine is in operation to furnish the power for suction. A suction plant has the advantage that as there is a slight vacuum in the apparatus it will not leak out gas to the injury and annoyance of the neighborhood.

Gas made by such plants is termed producer gas, and is suitable for either fuel or power purposes. It is not adapted to making illuminating gas, which requires the addition of hydrocarbons, obtained by the admixture of petroleum. According to Lucke the composition of producer gas (containing a little steam) is H, 9.2; CO, 25.3; CH_4, 3.1; C_2H_4, 0.3; CO_2, 3.4; N, 58.2; being a better mixture for power purposes than blast-furnace gas, Mond gas, or other cheap fuel gases.

GASSENDI, *gâs-sĕn'dē*, F. *gâ-sŏng-dē'* (or GASSEND), PIERRE: 1592, Jan. 22—1655, Oct. 14; b. Champtercier, Provence, dept. of the Lower Alps: French philosopher and mathematician. His unusual powers of mind showed themselves at an early age, and 1616 he became prof. of theology at Aix. After six years' study, he became disgusted with the scholastic philosophy, and undertook to maintain certain theses against the Aristotelians. His polemic appeared at Grenoble 1634, and was entitled *Exercitationes paradoxicæ adversus Aristoteteos.* It was accompanied by an expression of his belief in the church, for whose honor and glory he declared himself 'ready to shed the last drop of his blood.' He drew a distinction for the first time between the church and the scholastic philosophy, denying that the former must stand or fall by the latter. Gassendi now visited Paris, where he made several influential friends. In the same year in which he published his *Exercitationes*, he was appointed *prevôt* of the cathedral at Digne, an office which enabled him to pursue without distraction his astronomical and philosophical studies. In 1628 he travelled in Holland, and in a controversy with Robert Fludd, an English mystic, relative to the Mosaic cosmogony, gained the advantage of his incoherent opponent. At the recommendation of the Abp. of Lyon, brother of Cardinal Richelieu, Gassendi was appointed prof. of mathematics in the College Royal de France, at Paris, where he died. As a philosopher, Gassendi maintained, with great learning and ingenuity most, though not all, of the doctrines of Epicurus. He was chiefly interested in the physical science of Epicurus, and did much to revive the study of natural science. His philosophy was in such repute, that the savans of that time were divided into Cartesians and Gassendists. The two chiefs themselves always entertained the highest respect for each other, and were at one time on the friendliest terms. The agreeableness of their

intercourse, however, was for a while interrupted by the publication of a work of Gassendi's entitled *Dubitationes ad Meditationes Cartesii*, in which he expressed himself dissatisfied with the tendencies of the new system of philosophy introduced by Descartes. In opposition to Descartes' rationalism, Gassendi maintained the empirical origin of our ideas. In this respect his philosophy is similar to that of Locke.

He ranked Kepler and Galileo among his friends, and was himself the instructor of Molière. His principal work is *De Vita, Moribus, et Placitis Epicuri* (Lyon 1649) to which the *Syntagma Philosophiæ Epicureæ* (1649) belongs. It contains a complete view of the system of Epicurus. His *Institutio Astronomica* (1645) is a clear and connected representation of the state of the science in his own day; in his *Tychonis Brahæi, Nicolai Copernici, Georgii Puerbachii, et Joannis Regiomontani Astronomorum Celebrium Vitæ* (Par. 1654), he not only gives a masterly account of the lives of these men, but likewise a complete history of astronomy to his own time. Gassendi was pronounced by Bayle the greatest philosopher among scholars, and the greatest scholar among philosophers. His works were collected and published by Montmor and Sorbière (Lyon 6 vols. 1658).

GASSNER, *gâs'nėr*, JOHANN JOSEPH: 1727, Aug. 28—1779, Mar.; b. Bratz, near Pludenz, in the Tyrol: notorious exorcist. While he was a Rom. Cath. priest at Klösterle, in the diocese of Coire, the accounts of demoniacs in the New Testament, combined with the writings of celebrated magicians, brought him to the conviction that most diseases are attributed to evil spirits, whose power can be destroyed only by conjuration and prayer. He began to carry out his conviction by practicing on some of his parishioners, and succeeded so far as to attract notice. The Bp. of Constance called him to his residence, but having come very soon to the conviction that he was a charlatan, advised him to return to his parsonage. Gassner betook himself, however, to other prelates of the empire, some of whom believed that his cures were miraculous. In 1774, he even received a call from the bishop at Ratisbon, to Ellwangen, where, by the mere word of command, *Cesset* (Give over), he cured persons who pretended to be lame or blind, but especially those afflicted with convulsions and epilepsy, who were all supposed to be possessed by the devil. Although an official person kept a continued record of his cures, in which the most extraordinary things were testified, yet it was soon found that Gassner often made persons in health play the part of those in sickness, and that his cures of real sufferers were successful only so long as their imagination remained heated by the persuasions of the conjuror. He died in possession of the wealthy deanery of Benndorf, but had previously lost all repute.

GAST, v. *găst* [AS. *gást*, the breath, a spirit (see GHOST)]: in *OE.*, to frighten; to terrify: N. spirit; breath; a ghost.

GAST'ING, imp. GAST'ED, pp. frightened. GAST'NESS n. *-nĕs*, terror.

GAS'-TAR, or COAL'-TAR: thick, black, opaque liquid, which comes over and condenses in the pipes when gas is distilled from coal. It is slightly heavier than water, and has a strong, disagreeable odor. Coal tar is a mixture of many distinct liquid and solid substances, and the separation of the more useful of these constitutes an important branch of manufacturing chemistry. The tar is first distilled in large malleable iron stills, when *water* and *crude naphtha* first come over; and afterward, when the temperature rises, a heavy, fetid smelling oil, called *dead oil*, which sinks in water. There remains in the still a large residue of *pitch*, which is again distilled in brick ovens, giving off an oil called *coke-oil*, and leaving a large quantity of *pitch-coke*. The crude naphtha is purified by sulphuric acid and quicklime, and re-distilled, when it is nearly as colorless as water. This, then, forms the refined coal-tar naphtha of commerce. It is largely employed for blast-lamps; as a solvent for india-rubber and gutta-percha; to preserve animal substances from moth; and it is also burned to produce a fine carbon for the manufacture of printing ink. It is from the lighter portion of naphtha, called *benzole*, that the beautiful mauve and magenta colors are manufactured (see BENZOLE; DYE-STUFFS). Benzole is used for removing stains of fat or oil from cloth. The dead-oil or pitch-oil is sometimes used, in its crude state, as a cheap material for affording light in lamps burned in the open air. It contains considerable creosote, and forms the best preservative for wood in damp situations. The coke-oil is not of much commercial importance, but it can be burned in lamps, and this oil with the dead-oil, when consumed in a confined atmosphere, gives a smoky flame, the soot from which constitutes lamp-black. The pitch-coke is valuable as a fuel for melting iron, being free from impurities. Pitch itself is used for making asphalt pavement, also for roofing-felt.

From the last portion of the distillation of the crude naphtha, and the first of the dead-oil, a beautiful white crystalline solid, called naphthaline, is obtained. It has been long known without being applied to any useful purpose, but is now beginning to be employed for the manufacture of colors, in a similar way to benzole. The dead-oil contains also considerable quantities of a yellow solid termed paranaphthaline, a mere chemical curiosity.—The creosote is extracted from the dead-oil by stirring it with soda, in which the creasote dissolves. When this soda solution is boiled for some hours, and then has an acid added to it, the creosote separates as an oil on the surface of the fluid, and, when distilled, is nearly pure. This treatment requires to be repeated several times to get it quite pure, and to keep its color. Most of the creosote used by druggists is made from coal-tar. The creosote from wood is a similar though quite distinct body.—Sulphuric acid extracts both from the dead-oil and from the crude naphtha several volatile basic oils besides benzole

—namely, toluole, xylole, cumole, and cymole. **Aniline** and its derivatives are used in great quantities in the manufacture of dyes.

GASTEIN, *gâs'tīn:* valley in the s. of the Austrian duchy of Salzburg; branch of the upper Salzach valley; abt. 25 m. long, $1\frac{1}{4}$ m. wide. It is 3,000—3,500 ft. above the sea. Lofty mountains form its s. boundary, and lower ranges border its e. and w. sides. It is traversed by the river Ache, which, near Wildbad-Gastein, falls over rocks 200 ft. and again 280 ft. high; while another stream near has a fall of 250 ft. The valley contains, with two other villages, one of the most famous watering-places in Europe, *Wildbad-Gastein.* Here, 1865, was concluded the convention between Austria and Prussia respecting the duchies of Schleswig-Holstein and Lauenburg, which they jointly had taken from Denmark. Many thousand guests, mostly of the higher classes, visit the place in summer to bathe in the waters or drink them. The thermal springs, known since the 7th c., have a temperature of 117° F. and are beneficial in nervous affections, debility, and skin diseases. Pop. of entire valley, abt. 3,800.

GASTEROMYCETES, n. *găs'tėr-ō-mī-sē'tēz* [Gr. *gastēr,* the belly; *mukēs,* a mushroom]: in *bot.,* a class of the fungi in which the fructification is always inclosed at first, and only exposed in decay, as in the puff-balls.

GASTEROPODS, n. plu. *găs-tėr'ŏ-pŏdz,* or GASTROPODS, *găs'trō-pŏdz,* or GAS'TEROP'ODA, n. plu. *-ŏp'ŏ-dă* [Gr. *gaster,* the belly; *podēs,* feet]: class of mollusks, inferior in organization to cephalopods, but far superior to almost all other mollusks, and containing a multitude of species, the greater number marine, but some inhabitants of fresh water, and some terrestrial. Snails, whelks, periwinkles, limpets, cowries, and the greater number of mollusks with univalve shells belong to this class, and univalve mollusks constitute the greater part of it; but it contains also some mollusks with multivalve shells, as chitons, and some, as slugs, which have either only a rudimental internal shell, or no shell at all. Some aquatic kinds are destitute of shell in the adult state, but they are protected by a rudimentary shell on first issuing from the egg. No known gasteropod has a bivalve shell, unless the *operculum,* which closed the mouth of the shell in many species, be regarded as a second valve. GAS'TEROP'ODOUS, a. *-ŏp'ŏ-dŭs,* pertaining to the gasteropods.

Gasteropods have a head, more or less fully developed, in which is situated the mouth, and which generally carries two to six fleshy, retractile tentacula. The tentacula do not encircle the mouth; they seem to be special and exquisitely sensitive organs of touch, a sense which the general surface of the body does not seem to possess in a high degree; and in some gasteropods,e.g. snails, they carry the eyes at their tips, but in others the eyes—always small—are situated elsewhere on the head, and a few are destitute of eyes. They are believed to possess the senses

of taste and smell, and at least some of them that also of hearing, as they not only have a nervous centre analogous to the acoustic division of the brain in vertebrate animals, but also a little sac on each side, apparently an organ of this sense. Their nervous system is more complex and concentrated than that of the headless (*acephalous*) mollusks; the principal nervous masses surround the gullet. In the highest gasteropods, such as snails, there are only two principal nervous masses, one of which, supplying the nerves connected with sensation, is called the brain. The blood of gasteropods is often opalescent, with a few colorless corpuscles. The heart is always *systemic*, and in almost all consists of one auricle and one ventricle, although a few gasteropods have two auricles, one for each set of gills. Near the commencement of the aorta, there is often a contractile muscular swelling (*bulbus arteriosus*) as in fishes. Respiration takes place generally by gills, which are very variously situated, sometimes externally, sometimes in a special cavity, and exhibit an equally great variety of form and structure; but some gasteropods, as snails and slugs, have instead of gills, a pulmonary sac or cavity lined with a vascular net-work, these being either inhabitants of the land, or, if of the water, obliged to come occasionally to the surface for breathing. A few of the lowest gasteropods, doubtfully placed in this class, are destitute of distinct respiratory organs. The digestive apparatus also exhibits much diversity. Some of the gasteropods feed on vegetable, some on animal substances, and some of them on animals which they themselves kill. Thus, while snails eat leaves and other soft parts of vegetables, whelks (*Buccinum*) prey on other molluscs, and are provided with a remarkable apparatus at the end of a proboscis into which the mouth is elongated, for filing a hole—as nice as could be made by the drill of a mechanic—through the hardest shell. The mouth of the snail is, in like manner admirably adapted to the cutting of leaves or similar substances by the action of the lips against a sharp horny plate. Other gasteropods have the mouth furnished with two cutting blades, wrought by powerful muscles. The tongue of some is covered with minute recurved hooks, to prevent the possibility of anything escaping from the mouth; and the stomach of some is a muscular gizzard, provided with cartilaginous or sometimes calcareous projections, or stomachic teeth, to aid in the comminution of the food. The intestine is generally bent back, so that the anus is not far from the head. The liver is large, as are also the salivary glands of many gasteropods. Very great diversities are found in the reproductive system. In some gasteropods, the sexes are distinct (G. Diœcia); others are hermaphrodite (G. Monœcia); and while self-impregnation takes place in some of these, others—as snails—mutually impregnate each other by copulation. In general, the reproductive organs are very largely developed, and are of complex and remarkable structure. The gasteropods are in general

oviparous; a few are ovoviviparous. The young of aquatic gasteropods at first swim about actively by means of ciliated fins attached to the head. Gasteropods are generally unsymmetrical, one side of the body being developed without the other, some of the principal organs of which—the gills and nerves—are atrophied; and thus the shell with which most of them are covered becomes, in the greater number, spiral, the spire turning toward the unatrophied side, generally the right side, though in some (*reversed* or *sinistrorsal* shells) it is the left. The head and the organ of locomotion are capable of being withdrawn into the last whorl of the shell, and in aquatic species generally, the mouth of the shell can be closed by an *operculum* (q.v.), exactly fitting it, and attached to the *foot*, but in which many varieties of beautiful structure are exhibited, and which is generally horny, sometimes calcareous. Some shells are simply conical, and there are numerous diversities of form. The shell is secreted by the *mantle*. See MOLLUSKS; SHELLS; UNIVALVES. The viscera are contained in a thin sac—part of the mantle—which fills the upper part of the shell. The organ of locomotion, called the *foot*, is in general a muscular disc, developed from the ventral surface of the body; sometimes, as in limpets, capable of acting as a sucker, and exhibiting other even more remarkable modifications, so that in some it becomes an organ for swimming. Gasteropods generally creep by means of this disc adhering to surfaces, and contracting in transverse wrinkles or undulations, which begin from behind. The gasteropods generally secrete a peculiar kind of slime. Some of them produce other peculiar secretions, of which the Tyrian purple is an example. Gasteropods have a great power of renewing lost parts; tentacles are thus restored, and even the eyes which they bear at their tips, the mouth with all its apparatus, or the head itself.

GASTON, *găs'ton*, WILLIAM, LL.D.: lawyer: b. s. Killingly, Conn., 1820, Oct. 3; d. 1894, Jan. 19. He graduated at Brown Univ. 1840, studied law, was admitted to the bar 1846, and practiced in Roxbury, Mass. till 1866 when he removed to Boston. He was a member of the Mass. assembly 1853–4 and 56, mayor of Roxbury 1861–2, state senator 1868, mayor of Boston 1871–3, several times unsuccessful candidate for member of congress and gov.; and elected gov. 1874–76. He afterward applied himself to his law practice. He was a democrat in politics.

GASTON DE FOIX: see FOIX.

GASTORNIS, n. *găs-tawr'nĭs* [named after *Gaston* M. Plaute, its discoverer; Gr. *ornis*, a bird]: a huge fossil bird from the Eocene; one either of the Natatores or of the Cursores. The only known species is the *Gastornis parisiensis* of the Paris basin.

GASTRÆA, n. *găs-trē'ă* [Gr. *gastēr*, the stomach]: a minute animal of the simplest description supposed to have once existed, being a form of the *Gastrula*. GASTRÆA

THEORY, the theory which endeavors to establish that all animals above the *Protozoa*, with the exception of the sponges, take their origin from a form of *Gastrula*, which proceed upward to the more perfect forms by the mere enlargement and differentiation of the primitive layers of cells representing the persistent *ectoderm* and *endoderm*.

GASTRÆUM, n. *găs-trē'ŭm* [Gr. *gastēr*, the belly]: the whole of the under surface of an animal's body.

GASTRALGIA, n. *găs-trăl'jĭ-ă* [Gr. *gastēr*, the belly; *algos*, pain]: pain in the region of the stomach, a symptom of indigestion; also called GASTRODYNIA: see GASTRIC: also CARDIALGIA.

GASTRIC, a. *găs'trĭk* [L. *gastricus*, gastric—from Gr. *gastēr*, the belly or stomach: F. *gastrique*]: relating to the belly or stomach in man; applied to certain forms of fever. GASTRIC JUICE, the fluid secretion of the stomach which acts as one of the agents in digestion (see DIGESTION). GASTRI'TIS, n. *-trī'tis* [*itis*, denoting inflammation]: inflammation of the stomach (see STOMACH, DISEASES OF). GASTRO, *găs'trō*, in *anat.* and *med.*, a prefix in compound words signifying related to, or connected with, the stomach. GAS'TRODYN'IA, n. *-dĭn'ĭ-ă* [Gr. *ŏdŭnē*, pain]: a painful affection of the stomach (see CARDIALGIA). GASTRO-ENTERITIS (see STOMACH, DISEASES OF; also ENTERITIS). GASTRONOMY, n. *găs-trŏn'ŏ-mĭ* [Gr. *nŏmŏs* a law]: the art or science of good eating; epicurism. GAS'TRONOM'IC, a. *-trō-nŏm'ik*, or GAS'TRONOM'ICAL, a. *-ĭ-kăl*, pertaining to the stomach or good living. GASTRON'OMIST, n. *-ŏ-mĭst*, one who likes good living; also GASTRON'OMER. GASTRONOME, n. *găs'trō-nōm* [F.]: an adept in gastronomy. GASTROS'TOMY, the formation of a fistulous opening into the stomach in order to introduce nourishment in case of injury or disease of the esophagus causing occlusion of that tube. GASTROT'OMY, n. *-trŏt'ō-mĭ* [Gr. *tomē*, a cutting]: the operation of making an incision into the stomach for removing a foreign body. The term was formerly used to denote any operation involving an incision into the abdomen.

GASTRITIS — GASTRODYNIA — GASTRO-ENTERITIS: see GASTRIC.

GASTROCHÆNA, *găs-trō-kē'nâ:* genus of lamellibranchiate mollusks, having a delicate shell of two equal valves, gaping very much in front; the animal sometimes taking possession of an already existing cavity, which it often lines with a calcareous lining, so as to form a tube, to which the valves of its shell are cemented; sometimes burrowing for itself in sand, madrepores, or calcareous rocks, and lining its hole with a shelly layer. *G. modiolina*, common in the Mediterranean, perforates shells and limestone, making holes about two inches deep and half an inch in diameter. It sometimes bores right through an oyster into the ground below, and makes for itself a flask-shaped case, with its neck fixed in the oyster-shell. The tubes of some of the tropical species which live in sand are very curious.—To the family *Gastrochænidæ* are referred *Aspergillum* and *Clavagella*.

GASTROCNEMIUS, n. *găs'trŏk-nē'mĭ-ŭs* [Gr. *gastēr*, the belly; *knēmē*, the leg]: applied to the muscle which principally forms the calf of the leg, and whose office it is to extend the foot. It arises by two heads from the two condyles of the thigh-bone, and is inserted by the *Tendo Achillis* (see FOOT) at the posterior part of the heel-bone. In man, these muscles possess great power, and are constantly called in use in standing walking, leaping, etc. In walking, they raise the heel, and, with it, the entire body from the ground; and the body being thus supported on the raised foot, the other leg is carried forward. From their close association with the erect position, they are much less developed in other mammals than in the human subject.

GASTRODIA, *găs-trō'dĭ-â:* genus of orchids. *G. sesamoides* is a native of Van Diemen's Land, and its roots form large coral-like masses, sometimes called *native potatoes*, being edible; but they are watery and insipid.

GASTROMALACIA, n. *găs'trō-măl ā'sĭ-ă* [Gr. *gastēr*, the stomach: L. *malăcus*, Gr. *malăkos*, soft to the touch, tender]: a softening of the stomach, held to be due to the action of the gastric juice on the coats of the stomach after death.

GASTROPODS, n. plu.: see GASTEROPODS.

GASTRORRHŒA, n. *găs'trŏr-rē'ă* [Gr. *gastēr*, the belly; *rhĕō*, I flow]: the catarrh of the stomach in dogs, attended with the discharge of abundant and dense mucus.

GASTRULA, n. *găs trô'lă* [a dim. formed from Gr. *gastēr*, the stomach]: a name applied to the developmental stage in various animals in which the embryo consists of two fundamental membranes, an outer and an inner, inclosing a central cavity which communicates with the outer water by a single primitive opening: see GASTRÆA.

GAS, WATER. See FUELS.

GAS, WOOD. See FUELS.

GATACRE, Sir WILLIAM FORBES, English soldier: b. 1843; d. 1906, March 6. He joined the English army in 1862; was instructor of surveying in the Royal Military College in 1875–9; deputy-adjutant and quartermaster-general in the Hazara Expedition in 1888, and in the Burma, Tonhon Expedition in 1889. He led the British forces in the Sudan in 1898, during the first advance against Atbara, and later commanded a British division in that region during the movement against Khartum and Omdurman. When the war in South Africa broke out he was ordered there and given an important command. He was repulsed at Stormberg with heavy loss. In April 1900 he was recalled to England.

GATCHINA: see GATSCHINA.

GATE, n. *gāt* [Goth, *gatvo;* Dan. *gade*, a street: Icel. *gota*, a street, a path—from *gat*, a hole—*lit.*, a way to get at a thing]: an entrance-door to a city, castle, etc.; a large frame of wood moving on hinges which opens or closes

any passage; a door. GATE'LESS, a. without a gate. GA'TED, a. having gates. GATE'WAY, n. a way through a gate; the gate itself. The gateway, as a passage or opening in which a gate or large door is hung, may be either an open way with side pillars or a covered way vaulted or roofed. The gateway being a most important point in all fortified places, is usually protected by various devices. It is flanked by towers with loopholes, from which assailants may be attacked, and is frequently overhung by a machicolated battlement, from which missiles of every description were poured upon the besiegers. City gates, and gates of large castles, have in all ages been the subjects of great care in construction; and when from some cause, such as the cessation of constant fighting, or a change in the mode of warfare, gateways have lost their importance in a military point of view, they have maintained their position as important architectural works. In very ancient times, we read of the 'gate' as the most prominent part of a city, where proclamations were made, and where the kings administered justice. The Greek and Roman gates were frequently of great magnificence. The propylæa at Athens is a beautiful example, and the triumphal arches of the Romans are the ornamental offspring of their city gates. Most of the towns in Britain have lost their walls and city gates; but a few remaining, such as York and Chester, give some idea of the ancient construction. The castles retain more of their ancient gateways, from which may be imagined the frowning aspect of every town during the middle ages. Abbeys, colleges, and every class of buildings were shut in and defended by similar barriers; many of these still exist in Oxford and Cambridge, and the abbey gates of Canterbury and Bury St. Edmund's are well-known specimens of monastic gateways. On the continent of Europe the remaining constructions of this kind are more numerous.

GATE OF ITALY: narrow mountain gorge, part of the valley of the Adige, near Trent and Rovedero.

GATE OF TEARS: portion of the strait of Bab el-Mandeb, the entrance from the Indian ocean into the Red Sea. It was so named by the Arabs from the number of wrecks due to the dangerous navigation.

GATES, *gāts*, ELMER, American pyschologist and inventor: b. Dayton, Ohio, 1859. He has done much original work in electric meteorology and has made several electrical mining inventions. He is the author of a system of mind-building and experimental psychology, having four laboratories for experimental research in these fields. Among his works are: *Psychurgy or the Art of Using the Mind; Art of Mind-Building.*

GATES, HORATIO: 1728–1806, Apr. 10; b. Maldon, Essex, England: general in the American army of the Revolution. He early entered on a military career, and first bore arms under Prince Ferdinand of Brunswick. Sent to America 1755, as capt. of infantry, he served under Gen.

Braddock, and with difficulty escaped in the defeat in which that officer was slain. On the peace of 1763, he purchased an estate in Virginia, where he resided until the war of independence. In this struggle, he sided with his adoptive, against his native, country, and 1775 was made ad.gen. with the rank of brig. in the colonial army. He accompanied Washington to Mass. 1775, July; and 1776, June, received the chief command of the army which had just retreated from Canada. In 1777, Mar., he superseded Schuyler in command of the army of the North, but being considered too prudent, was himself superseded by Schuyler in May following. In Aug., however, he once more undertook the command, and soon compelled the entire British army under Burgoyne (consisting, as some say, of 5,700 men, or as others, of 3,500) to surrender at Saratoga. This brilliant success gained for him a great military reputation, and his considerate conduct toward his compatriots won him the esteem of even his enemies. In 1780, Gates was called by Congress to the command of the army of the South, and in his unfortunate defeat by Cornwallis at Camden lost his laurels. He was superseded by Gen. Greene, and was not acquitted of blame by court-martial till 1782, after a protracted trial. He then retired to Va. till 1790, when he emancipated all his slaves, and settled in N. Y. 1800, receiving the honor of the 'freedom of the city,' and was soon elected to the state legislature.

GATES, Lewis Edwards, American educator and critic: b. Warsaw, N. Y., 1860, March 23. He is a brother of M. E. Gates (q.v.). He was graduated at Harvard 1884, instructor in forensics there 1884–7, instructor in English 1890–6, then becoming assistant professor of English. He is a frequent contributor of critical articles to the magazines. He has published: *Selections from Jeffrey* (1894); *Selections from Newman* (1895); *Selections from Matthew Arnold* (1898); *Three Studies in Literature* (1899); *Studies and Appreciations* (1900).

GATES, Merrill Edwards, ph.d., ll.d.: educator: b. Warsaw, N. Y., 1848, Apr. 6. He graduated at Rochester Univ. 1870, was chosen principal of Albany Acad. the same year, and pres. of Rutger's College, New Brunswick, N. J., 1882, and was appointed a member of the U. S. board of Indian commissioners 1884. He received the degree ph.d. from the Univ. of N. Y. 1880, and ll.d. from Princeton College 1882. 1890, Aug., he was elected pres. of Amherst College; resigned, 1899.

GATESHEAD, *gāts'hĕd:* town of England, county of Durham; an ancient borough under the Episcopal palatines of that county; since 1835 a parliamentary and municipal borough. It is on the south bank of the Tyne, directly opposite Newcastle, to which it is joined by two bridges, and with which it is otherwise so closely connected as virtually to form one town with it. Gateshead has an excellent dispensary, established after a dreadful visitation of cholera 1831–2, which carried off 1,028 of the population. The numerous coal-mines in the neighborhood, iron-works

and foundries, glass-works, brick, tile, and soap works, ship-building, chemical-works, etc., furnish employment to the inhabitants. There are also extensive manufactures of anchors, machinery, chain-cables, iron-wire and other ropes. At Gateshead Fell are quarries from which the famous grindstones erroneously but proverbially known as 'Newcastle grindstones', are obtained, and exported to all parts of the world. Gateshead is supposed to have been a Roman station, or outwork to the Roman station at Newcastle, several coins and other relics having been found from time to time. The derivation of the name has been long matter of dispute, but the probability is, that it simply means the head of the *gate* or road with which the Romans connected Newcastle with the southern military divisions and defenses.—Pop. about 110,000..

GATH, *găth* [Heb. 'wine-press']: one of the five chief cities of the Philistines. It was on the frontiers of Judah, and of much importance in the wars between the Philistines and the Israelites. It formed, in fact, the key of both countries, and was strongly fortified. The giant Goliath, slain by the stripling David, was a native of this place. Jerome describes it in his time as a 'very large village'. The site of ancient Gath is probably the little eminence, about 200 ft. high, now known as Tell-es-Sâfret, at the foot of what were anciently called the Mountains of Judah.

GATHER, v. *găth'ėr* [Ger. *gattern;* Dut. *gaderen,* to draw to a head]: to bring together; to collect; to accumulate; to assemble; to infer; to pick, as fruit; to draw together or pleat the width of the skirt of a dress to correspond to the width of the band at the waist; to generate matter, as in a sore: N. a pleat or pucker in the made-up trimming of a dress. GATH'ERS, n. plu. *-ėrz,* trimmings for a dress made by the dressmaker in the form of frills and puffs. GATH'ERING, imp.: N. an accumulation; a collection; an assemblage; an accumulation of pus or matter; a small ulcer. GATH'ERED, pp. *-ėrd:* ADJ. drawn up in pleats, frills, or puffs, as a dress. GATH'ERER, n. one who. GATH'ERABLE, a. *-ă-bl,* that may be collected. To GATHER BREATH, to take time to recover breath after exhaustion or violent exercise; to have respite.—SYN. of 'gather, v.': to muster; congregate; call; pluck; harvest; amass; consolidate; bring together; pucker; plait; derive; conclude.

GATINEAU, *gâ-tē-nō':* river of Canada, in the province of Quebec; starting in a connected chain of large lakes n. of the 48th parallel of latitude. It flows in an almost undeviating course s.s.w., and falls into the Ottawa, 12 m. below the town of Aylmer. The length of this river has not been definitely ascertained, but it is said that canoes have navigated it more than 300 miles.

GATLING, RICHARD JORDAN, American inventor: b. Hertford County, N. C., 1818, Sept. 12; d. New York 1903. While a boy he assisted his father in perfecting a machine for sowing cotton seed, and another for thinning out cotton

plants. Subsequently he invented a machine for sowing rice. Removing to St. Louis in 1844, he adapted this invention to sowing wheat in drills. For several winters he attended medical lectures in Cincinnati, and in 1849 removed to Indianapolis, where he engaged in railroad enterprises and real estate speculations. In 1850 he invented a double-acting hemp brake, and in 1857 a steam plow, which however, he did not bring to any practical result. In 1861 he conceived the idea of the revolving battery gun which bears his name. Of these he constructed six at Cincinnati, which were destroyed by the burning of his factory. Afterward he had 12 manufactured elsewhere, which were used by Gen. Butler on the James River. In 1865 he improved his invention, and in the year following, after satisfactory trial, it was adopted into the United States service. It has also been adopted by several European governments. At the time of his death he was perfecting a few business formalities prior to placing his new motor plow on the market. Although best known as the inventor of a terrible death-dealing weapon, he was the gentlest and kindliest of men. The sight of returning wounded soldiers early in the Civil War led him to consider how war's horrors might be alleviated. By making war more terrible, it seemed to him nations would be less willing to resort to arms, and he accordingly devoted himself to the study of ordnance and ballistics, with this end in view.

GAT'LING GUN: revolving battery gun invented by Richard Jordan Gatling, (q.v.), and in general use in the U. S. army and navy, in England, Austria, France, Russia, Italy, Turkey, and other countries. The idea of the gun was conceived 1861, and the first one was completed and tested 1862, when it discharged an average of 200 shots per minute. Dr. Gatling failed to induce the chief of ordnance to even examine his invention, but Gen. Butler was quick to perceive the advantages of the machine-gun and bought 12 of them for use on the James river, Va. Various improvements were made on the original gun, and after the close of the civil war Secretary Stanton ordered an official test at Washington and Fortress Monroe, which resulted in the adoption of the weapon into the U. S. service. As first conceived the machine threw 200 musket bullets per minute, but by improvements the speed of firing has been increased to 1,200 shots per minute and the range to 1½ m., and the machine is made of various calibres and weights for different kinds of service. In its perfected form it may be described as a number (usually 10) of ordinary breech loading rifled barrels grouped around a common axis with which they lie parallel and about which they revolve. In manipulating the gun one man places one end of a feed-case of cartridges into a hopper at the top of the gun, while a second man turns a crank by which the gun is revolved. When the bullets are discharged the empty shells are thrown out automatically, and when one feed case has been emptied another is substituted without interfering with the revolution of the machine or the dis-

charge of its barrels. Each barrel is fired once in a revolution, so that every turn of the crank discharges 10 shots.

GATSCHET, Albert Samuel, American linguist: b. Berne, Switzerland, 1832, Oct. 3, d. Washington, D. C., 1907, Mar. 16. He was educated at the universities of Berne and Berlin, and removing to New York in 1868 made a special study of the languages of the American Indians. In 1879 he became connected with the Bureau of American Ethnology.

GATSCHINA, *gât-shē'nâ:* town of Russia, govt. of St. Petersburg; abt. 30 m. s.s.w. of St. Petersburg, on a small lake formed by the Ishora. It is charmingly situated and regularly built. It has some manufactures of porcelain; but is notable especially for its royal palace, a structure at once simple in style and imposing in effect. This palace, which contains 600 apartments, and is surrounded by one of the finest pleasure-gardens in Europe, was the favorite seat of the Emperor Paul I., who bestowed muncipal rights upon the town of Gatschina 1797. Pop. 12,000.

GATTINE, n. *găt'tĭn* [a corruption of *catkin:* It. *gattino*, a kitten]: a disease in silkworms caused by the fungus *Cladospōrĭŭm herbārum*, so called from the dead caterpillars presenting the fancied appearance of a catkin; the disease *muscardine* presents that of a little cake or a kind of pastille.

GAU, *gow* [of doubtful origin, possibly allied to Gr. *ge*, land]: German word meaning, in a general way, country (as opposed to the town), district; but applied specially to a political division of anc. Germany, having relation to the arrangements for war and the administration of justice. A gau embraced several communities or villages, and had one or more grafs (q.v.) and judges over it. As the grafdome became more and more hereditary, the gau, as a political division, fell into disuse (about the 12th c.), and only in the names of some places do the traces of it remain. The Abbot Bessel gave a complete account of the geography of the German gaus in his *Chronicon Gottwicense;* and Sprunner's *Historical Atlas* contains a map of them. The nature of the gau system is fully discussed in the works of Eichhorn, Waltz, and Bethmann-Hollweg. See Hundred.

GAUCHE, a. *gōsh* [F.]: 'left' as opposed to 'right'; clumsy; awkward. Gaucherie, n. *gōsh'rē* or *gōsh'ĕr-ē*, behavior inconsistent with the received forms of society; awkwardness; clumsiness.

GAUCHOS, *gow'chōz*, hybrid inhabitants of South America, mostly cattle-raisers of nomadic habits. They are natives of the pampas, and descendants of Spaniards and Indians. The white strain has largely faded out from them, and a modified Indian type has been developed which has an ethnological interest. As a distinct people, however, they may be said to be disappearing. They are now mainly confined to the Chaco region. Many of them possess figures and bearing which show a proud descent. They wear a costume picturesque in fashion and color,

and their skill as horsemen and in using the lasso and bolas is remarkable.

GAUD, or GAWD, n. *gawd* [Dut. *goud*, gold: mid. L. *gaudĭŭm*, a large bead on a rosary: Gael. *gòdach*, showy, ornamental—from *gòd*, show, ornament]: in *Scot.* and *OE.*, an ornament; a jewel; a bauble or trinket: V. to decorate with gauds. GAUD'ING, imp. GAUDED, pp. *gawd'ĕd*, decorated with gauds; colored; painted. GAUDY, a. *gawd'ĭ*, showy; gay; ostentatiously fine. GAUD'ILY, ad. *-lĭ*. GAUD'INESS, n. *-ĭ-nĕs*, showiness; tinsel appearance.

GAUD, n. *gawd* [F. *gaudir*, to be merry: L. *gaudĭŭm*, joy, gladness]: in *Scot.* and *OE.*, a feast; a trick; a bad custom or habit. GAUDY, n. *gawd'ĭ*, a feast; a festival; a day of plenty: ADJ. festive; frolicsome; tricky.

GAUDEAMUS, n. *gawd'ē-ā'mŭs* [L. *gaudĕāmus*, let us rejoice]: a rejoicing; a triumph.

GAUDEN, *gaw'dėn*, JOHN, D.D.: 1605–1662, Sep. 20; b. Mayland, Essex, England: Bp. of Exeter and Worcester and reputed author of *Eikon Basilike* (q.v.). He was educated at Bury St. Edmund's and St. John's College, Cambridge, obtained the vicarage of Chippenham and rectory of Brightwell 1630, preached before the house of commons 1640, and was granted by it the deanery of Bocking 1641; became master of the temple 1659, bp. of Exeter 1660, and bp. of Worcester through an applicant for the vacant see of Winchester 1662. He published a number of works but *Eikon Basilike; the Portraiture of his Sacred Majesty K. Charles I. in his Solitudes and Sufferings*, is the most noted because of the disputed authorship. It was at first and by many is still believed to have been written by the King himself. Experts have pronounced in favor of both King and Gauden, but Sir James Mackintosh, after carefully examining all the evidence, ascribes the authorship to Bishop Gauden.

GAUFFERING, n. *gawf'fėr-ĭng* [see GOFFER; comp. F. *gaufre*, a honeycomb; *gaufrer*, to figure]: a style of arranging frills, having somewhat the appearance of puffs, done by means of irons like the round thick blades of large scissors, or by a machine.

GAUGE, or GAGE, n. *gāj* [F. *jauger;* OF. *gauger*, to estimate the number of bowls in a vessel—from OF. *gauge*, a gauge; F. *jale*, a bowl—from mid. L. *gaugĭă*, the standard in measure of a wine-cask]: a measuring rod; a measure in general; a standard of measure; on a *railroad*, the distance between the rails, usually 4 feet 8½ inches; a workman's tool; a mixture of certain stuff and plaster, used in finishing the best ceilings, and for mouldings: V. to measure or ascertain the contents of a cask or vessel; to measure or ascertain, as the quantity, diameter, etc. GAUG'ING, imp.: N. the act or art of measuring the contents or capacity of a vessel; when the term is used without qualification, it refers to gauging the contents of casks, according to sliding-scales graduated by the mathematical rules for determining solid contents of regular solids approximating to the form of the

casks. GAUGED, pp. *gājd.* GAUG'ER, n. *-ėr*, measurer; usually an excise officer who measures the contents of casks holding liquors. GAUGE'ABLE, a. *-ă-bl*, that may be gauged. GAUGE-COCKS, two or three small cocks in front of the boiler of a steam engine for ascertaining the height of the water. GAUGING-ROD, an instrument for ascertaining the liquid contents of casks.

GAUGE, or GAGE, apparatus for measuring any special force or dimension; e.g. *pressure-gage*, *wind-gage* (see ANEMOMETER), *rain-gage* (q.v.), *wire-gage*, *button-gage*, etc. The simplest form of gage of dimension is the common *wire-gage*, by which the diameter of wire is measured. It is simply an oblong plate of steel, with notches of different widths cut upon the edge; these are numbered, and the size of the wire is determined by trying it in the different notches until the one is found which it exactly fits. The thickness of sheet metal is tried by the same gage. There is great want of uniformity in these gages;—and it has been proposed, in order to enable definite descriptions and orders to be given with accuracy, that instead of the arbitrary numbers of varying signification now in use, decimal parts of an inch, tenths, hundredths, thousands, or still smaller

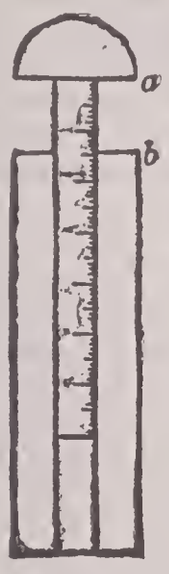


Fig. 1.

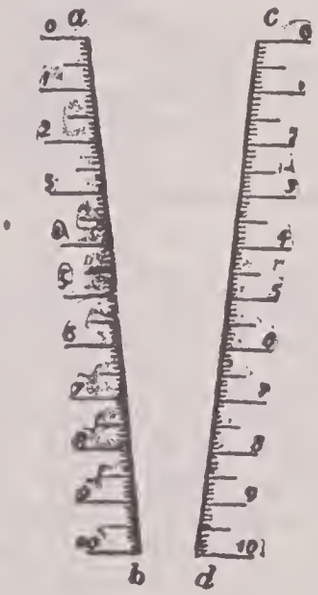


Fig. 2.

fractions, if necessary, be used, and that these be used for all diameters and thicknesses, such as wires, sheet-metals, buttons, watch-glasses, etc.; but such a scale has not yet come into general use. The gage commonly used for buttons, watch-glasses, and such like large diameters, is a rule with a groove cut lengthwise down the middle. Another metal rule, with a brass head slides in this, and by means of a thumb-pin, may be pushed out at pleasure. The object to be measured is placed between *a* and *b* (fig. 1), and that width of this space is measured by graduatious on the middle metal slide.

A very elegant and delicate gage has recently come into use for measuring watch-glasses, and is applicable to many

other purposes. On an oblong piece of sheet-metal, two straight metal ridges are fixed in such a manner that they shall be inclined at a given angle to each other, as *ab* and *cd* (fig.2). Now let us suppose the angle to be such that the distance between *a* and *c* is 2 inches, and that between *b* and *d* is 1 inch, while the lengths *ab* and *cd* are 10 inches. It is evident that for every inch of descent from *a* and *c* towards *b* and *d*, there will be a narrowing equal to $\frac{1}{10}$ of an inch; and for every tenth of an inch of such descent, there will be a narrowing of $\frac{1}{100}$ of an inch, and so on; thus we may, by graduating downward from *ac* to *bd*, measure tenths by units, hundredths by tenths, and so on to still finer quantities if required. This is applicable to lengths as well as diameters. By means of fine screws with large graduated heads, Messrs. Whitworth have measured small pieces of steel to the one-millionth of an inch (see MICROMETER). For pressure-gages, wind-gages, etc., see the special titles. In railways, the gauge means the distance between the rails. See RAILROADS.

GAUL, n. *gawl* [L. *Gallĭă*, Gaul; *Gallus*, a Gaul]: the anc. name of France; a native of.

GAUL: see FRANCE.

GAULEY, *gaw'lē*, MOUNTAINS: portion of the Appalachian chain in W. Va., continuous to the s. w. with the Cumberland Mountains, and having numerous local names; the name Gauley being applied also to the section of the chain in Nicholas co. The region is wild and full of grand scenery. The GAULEY RIVER flows between its ridges.

GAULT, or GOLT, n. *gŏlt* [prov. Eng.]: in *geol.*, series of dark-blue marls or calcareous clays, a member of the Cretaceous Formation separating the Lower from the Upper Greensand. It consists of an upper part, hard and sandy, containing green particles scattered through it; and of a lower portion, a stiff dark gray, blue, or brown clay, smooth and uniform in texture, and very plastic, which is manufactured into tiles, bricks, and even common pottery. Concretions of iron pyrites and other nodules are frequent in the Gault. The contained fossils are for the most part beautifully preserved, having been protected from decay by being buried in the tenacious and compact mud which forms the Gault beds. The most abundant remains are those of cephalopodous mollusks, as ammonites, scaphites, and turrilites. GAULT, v. to dress land with clay: GAULT'ING, imp.: N. in *farming*, the process of dressing certain descriptions of soil with clay. GAULTED, pp. *gŏlt'ĕd*.

GAULTHERIA, *gawl-thē'rĭ-â:* genus of small procumbent or nearly procumbent evergreen shrubs, of the nat. ord. *Ericeæ*, the fruit of which is a 5-valved capsule, covered with the enlarged and fleshy tube of the calyx. They are natives of temperate regions. *G. procumbens* is common in N. America as far south as Va., and bears the names of PARTRIDGE BERRY, DEER BERRY, WINTERGREEN, and MOUNTAIN TEA. It is four or five inches in height, with small whitish flowers and red 'berries,' which

are eatable, but not safe for eating in any considerable quantity, because of the pungent volatile oil which they contain. Brandy in which they have been steeped is used as a tonic. The whole plant has an agreeable aromatic odor and taste, owing to the presence of volatile oil, which, when extracted, is used in medicine as a stimulant, also by druggists for flavoring sirups, and in perfumery, under the name of *Oil of Winter Green*. The leaves are used both as an astringent and as a stimulant; and an infusion of them is used as tea in some parts of America, for which purpose those of another species are employed in Nepaul.—The

Procumbent Gaultheria (*Gaultheria procumbens*):
a, fruit; *b*, flower.

SHALLON (*G. shallon*) is a comparatively large species, two or three ft. high, with purple berries, which are agreeable to the palate and form part of the food of Indians in the n. w. of America, of which the plant is a native. It grows well under the shade of woods, and has of late been planted in many places in Britain, to afford food for pheasants and other kinds of game.—*G. hispida* is a native of Van Diemen's Land, bearing snow-white berries, and known by the name of WAX-CLUSTER: the berries are eatable.—Other species, some of which are fragrant, some produce edible berries, and all are beautiful little shrubs, are found in the Himalaya Mountains, the mountains of S. America, Australia, etc. The Australian *G. antipoda* is said to be a finer fruit than *G. hispida*.

GAUNT, a. *gânt* or *gawnt* [Gael. *gann*, poor, lean; prov. Sw. *gank*, a lean starved horse. AS. *gewaned*, diminished: W. *gewan*, weak]: lean, meagre; empty and thin after long fasting, or by disease; pinched and grim. GAUNT'LY, ad. *-lĭ*. GAUNT'NESS, n. leanness with grimness.

GAUNTLET: see GANTLET.

GAUNTLETT, *gânt'lĕt*, HENRY JOHN, MUS. D.: 1806—1876, Mar. 4; b. England. He became organist of Olney Church, Bucks, when 9 years old, and of St. Olave's, Southwark, when 21. He was one of the first to introduce the Bachargan, edited the last two parts of the *Psalmist* (1836-

41), together with Mr. Kearies the *Comprehensive Tune-Book* (1846–7), and with Rev. W. J. Blew the *Church Hymn and Tune Book* (1844–51), edited and composed the music in the *Congregational Psalmist* (1851), Carlyle's *Manual of Psalmody* (1860). *Tunes, Old and New,* and Harland's *Church Psalter and Hymnal* (1868). He received the degree MUS.D. from the abp. of Canterbury 1842, and was chosen by Mendelssohn to play the organ part in the *Elijah* on its first production at Birmingham 1846.

GAUR, or GOUR, *gowr:* ruined mediæval city of Bengal, British India, 50 m. n.w. of Moorshedabad. The name is derived from the ancient *Gauda,* 'country of sugar', and in Mohammedan is *Jennatabad,* 'abode of paradise'. The names of the dynasties and partial lists of their kings have been preserved, and show that the last dynasty, the Senas or the Vaidyas, superseded its predecessor, the Palas, about the middle of the 11th c., and that Lakshmanasena, at the close of that c., was its most eminent representative. In 1198–9 the Mohammedan gen., Bakhtiyar Khilji, after his victory at Nadiya, established himself as gov. of Bengal, fixed his capital at Lakhnaoti (Gaur), and founded mosques, colleges, and monasteries. That city was the seat of the rulers of Bengal and Behar during the next 140 years. In 1338 the kingdom of Bengal acquired an independence which it retained for more than two c.; and about 1350 the capital was transferred to Pandua, 16 m. n. by e. of Lakhnaoti, where other mosques and shrines were built. In 1446 the capital was restored to Lakhnaoti, and from that time the city was known by the name of Gaur. The earliest extant description of the city is found in meagre form in the Persian history *Tabaqát-i-Násirí,* whose author visited it 1243. But it was not till the English discovered its extensive and interesting remains, that anything like a definite idea of its ancient greatness could be formed. The remains of Gaur are spread over an area of more than 20 sq. m., and comprise enormous earthen embankments, 200 ft. thick at base, 40 ft. high, and faced with brick; bridges and roads of the same material; two gateways of rich architectural construction; an extensive fort containing a mausoleum, seven or eight grand mosques, a lofty tower, and numerous large tanks and reservoirs, one, the great Sagar Dighi, or 'ocean tank', a rectangular sheet of water, measuring nearly 1 m. by ½ m. What is considered the site of Gaur proper is an oblong space 7½ m. n. to s., and 1½ to 2 m. e. to w. It lies between the Bhagirathi and Mahanada rivers, which are from 2 to 6 m. apart, and was defended n.w. and s. by a rampart and ditch and e. by a great double embankment with 2 and 3 immense ditches between. The citadel or royal fortress and the palace stood within the w. wall near the s. end. Near the former is a tower of stone and brick, 84 ft. high, 21 ft. in base diameter, a 12–sided polygon two thirds its height and circular above. The entrance gate of small brick, with archway 34 ft. high, is ascribed to Barbak Shah 1466. The golden mosque of dark gray stone, 180 by 80 ft. with

44 domes, was erected 1525, and that of the 'Footstep of the Prophet' 1530. Large quantities of brick and stone from the ruins of Gaur were used in building Malda, Moorshedabad, Hoogly, Rungpore, and Calcutta, and some of its finest buildings are said to have been destroyed to supply sculptured stone for the cathedral in the latter city. Gaur doubtless was a city of great political, strategic, and commercial importance, with numerous outlying villages. The site has been for centuries covered by dense forests and rank jungle.

GAUR, or GOUR, *gowr* (*Bos Gaurus*): species of ox, inhabiting some of the mountain jungles of India. It is of very large size, though apparently inferior to the Arnee (q.v.). It resembles the Gayal (q.v.), but differs from it in the form of its head, and in the total want of a dewlap, in which it more nearly agrees with the Banteng of the Eastern Archipelago, though distinguished from that by important anatomical peculiarities: see BANTENG. The back is strongly arched, having a remarkable ridge of no great thickness, which rises above its general line, owing to an unusual elongation of the spinous processes of the vertebræ. The hair is remarkably short and sleek. The Gaur is formidable even to the tiger, and safe from his attacks. It is usually found in herds of 10 to 20. It is abundant in the high insulated table-land of Myn Pat, in South Baha, and in the adjoining steep and narrow valleys. It is supposed incapable of domestication; frequent attempts for this purpose are said to have been made in Nepaul.

GAURITZ, *gow'rĭts:* river of the s. coast of Cape Colony, s. Africa, e. boundary of the dist. of Zwellendam, entering the sea a little w. of Mossel Bay. Like nearly all streams of this region, it is rapid, and almost useless for the purposes, of navigation.

GAUSS, *gows,* KARL FRIEDRICH: 1777, Apr. 30–1855, Feb. 23; b. Brunswick: illustrious mathematician. In 1795 he went to the University of Göttingen, where he made a number of important discoveries, one of which had had the attention of geometers from the time of Euclid, viz., the division of the circle into 17 equal parts. He soon afterward returned to Brunswick, and 1801, published his *Disquisitiones Mathematicæ,* treating of indeterminate analysis or transcendental arithmetic, which contains, besides other important theorems a new demonstration of Fermat's theorem concerning triangular numbers. At that time Gauss knew little of what had been done in the same subject by previous mathematicians, which accounts for the presence in his work of a number of old theorems. But the discovery of the planet Ceres on the first day of the 19th c. guided the energies of Gauss into a new field of research. He was one of the first to calculate the elements of its orbit, according to methods of his own invention, and his assiduous application, and the accuracy of his results, excited general admiration. On the discovery of Pallas by Olbers 1802, Gauss set himself to calculate its orbit; and his results, valuable at the time, are even now models of

ingenuity and research. For these labors, he received, 1810, from the French Institute, the medal founded by Lalande. In 1807, he was appointed director of the Observatory at Göttingen; and in 1809 issued his celebrated work, *Theoria Motus Corporum Cœlestium in Sectionibus Conicis Ambientium*, developing a method of calculating, in the most simple and most exact manner, the orbits of the bodies in the solar system. To him chiefly the credit is due of discovering the great comet of 1811, the elements of whose orbit he calculated with surprising accuracy. In 1821, Gauss was charged by the Hanoverian govt. with the triangulation of the kingdom of Hanover, and the measurement of an arc of the meridian. In executing this work, Gauss was led to invent the Heliotrope (q.v.). About 1831, Wilhelm Edward Weber arrived at Göttingen, and communicated a part of his own enthusiasm for magnetic researches, to Gauss, who invented a 'magnetometer' which measures the 'magnetic intensity' with great accuracy, and probably contributed more to the advancement of this branch of science than any one before him. La Place pronounced Gauss the greatest mathematician of Europe. He died at Göttingen. Among his most celebrated works, are the *Disquisitio de Elementis Ellipticis Palladis ex Opposition-ibus Annorum* 1803–09 (1810); *Theoria Combinationis Observationum Erroribus Minimis Obnoxiæ* (Göttingen 1823), containing a full explanation of his peculiar method above mentioned; *Intensitas vis Magneticæ Terrestris ad Mensuram Absolutam Revocata* (1832), etc.

GAUSSEN, *gō-sŏng'*, François Samuel Robert Louis: 1790. Aug. 25—1863, June 18; b. Geneva, Switzerland: Prot. theol. writer. He received a university education, and was ordained to the ministry of the Swiss Ref. Church at Satigny, near Geneva, 1816. While there he became intimate with J. E. Cellérier, who had preceded him in the pastorate, and with members of the dissenting congregation at Bourg-de-Forer. In 1819 Gaussen and Cellérier published in the interest of Calvinistic orthodoxy a French translation of the second Helvetic confession, with a preface defending the use of confessions of faith; 1830 he was censured and suspended by his ecclesiastical superiors for having discarded the prescribed (rationalistic) catechism of his church; and 1831 was deprived of his charge for taking part in the formation of the evangelical soc. for the establishment of a new theol. hall. He spent some time travelling in Italy and England, returned to Geneva 1834, and preached to an independent congregation till 1836, when he was chosen prof. of systematic theol. in the evan gelical school which he had helped to found, and held the chair till 1857. His work *Theopneus* (1840), which in English translation has been republished in England and America, advocates the extreme view of verbal inspiration of the Bible. It is an able argument for a theory of orthodox speculation which, by its mechanical and extra-scrip-

tural nature, is felt to depend on a strong philosophical advocacy.

GAU'TAMA: see BUDDHISM.

GAUTIER, EMILE THÉODORE LÉON, *ā-mēl tā-ō-dōr lā-ôn gō-tēā*, French scholar and critic: b. Havre 1832, Aug. 8. He held official positions connected with the schools and libraries of his native place till his growing eminence as a writer brought him to Paris. His works, which place him among the very foremost authorities on mediæval European literature, include: *Definition Catholique de l'Histoire* (1860); *Benoit* II. (1863); *Etudes litteraires pour la defense de l'Eglise* (1864); *Epopees françaises* (1866–7); *Vingt nouveaux portraits* (1878); *La Chevalerie* (1884); *Histoire de la poésie religieuse dans les clôîtres des IXe et XIe siècles* (1888): *Etudes et tableaux historiques* (1890).

GAUTIER, JUDITH, *zhû-dēth*, French novelist, daughter of Théophile Gautier (q.v.) and Carlotta Grisi, the famous Italian singer: b. Paris, France, 1850. She married Catulle Mendès, but was divorced. Her first work, under the name 'JUDITH WALTHER', was *The Book of Jade* (1867), a collection of prose and verse translated from the Chinese; it was followed by *The Imperial Dragon* (1869), a Chinese romance, signed 'JUDITH MENDÈS'; *The Usurper*, a Japanese romance, crowned by the French Academy in 1875; *Lucienne* (1877); *The Cruelties of Love* (1878); *Isoline* (1881) *Poems of the Dragon Fly* (1884), adapted from the Japanese; *Potiphar's Wife* (1884), a Persian romance; *The Merchant of Smiles* (1888), a drama adapted from the Chinese; *The Marriage of Fingal* (1888), a lyric poem.

GAUTIER, THÉOPHILE, *tā-ō-fēl*, French poet and prose writer: b. Tarbes, France, 1811, Aug. 31; d. Paris, 1872, Oct. 23. He was educated at the grammar school of his native town, and afterward at the College Charlemagne in Paris. He applied himself at first, but without much success, to painting; and then turned to literature. In verse he published: *Albertus* (1830); *Comedy of Death* (1832); *Enamels and Cameos* (1856); his best poetry; etc. His novels and short stories include: *Young France* (1833); *Mademoiselle de Maupin* (1835); *Fortunio* (1838); *A Tear of the Devil* (1839); *Militona* (1847); *The Tiger's Skin* (1852); *Jettatura* (1857); *Captain Fracasse* (1863); *Handsome Jenny* (1865); *Spirite* (1866); etc. He was drawn early to feuilleton writing, and for more than 30 years contributed to the Paris newspapers criticisms on the theatre and the salon. He also wrote: *Journey in Spain* (1843); *Zigzags* (1845); *Constantinople* (1854); *Journey in Russia* (1866); etc., which rank among the most delightful books of modern travel. Still other works were an enlarged edition of *Enamels and Cameos* (1872); *The Grotesques* (1844); *History of Dramatic Art in France* (1859); *Balzac* (1858); *Private Menagerie* (1869), biographical; *History of Romanticism* (1872); *Literary Portraits and Souvenirs* (1875); *The East* (1877), the last two being posthumous. Gautier's whole philosophy is a philosophy

of paradox, his ideal of life hardly more than a picturesque viciousness. His besetting sin was a desire to say something clever and wicked to shock the Philistines. See lives by Feydeu (1874); Bergerat (1878); Richet (1893); Brunetière, *Evolution de la poésie lyrique* (1894).

GAUZE, n. *gâwz* [F. *gaze*, a thin open canvas: Norw. *gisen*, open in texture: probably *Gaza*, in Palestine, from which first brought]: a very thin, light, transparent fabric of silk or linen. Inferior qualities of gauze are made of a mixture of silk and cotton. Large quantities of gauze are made in France and Switzerland. GAUZE, a. made of gauze. GAUZY, a. *gâw'zĭ*, thin as gauze; like gauze.

GAVAZZI, *gâ-vât-sē'*, ALESSANDRO: 1809–1889, Jan.; b. Bologna: popular Italian preacher and reformer. He became a monk of the Barnabite order, and was appointed prof. of rhetoric at Naples, where he speedily acquired great reputation as an orator. On the accession of Pius IX. to the papal chair, Gavassi was one of the foremost supporters of the liberal policy which began with that pontiff's reign; and having repaired to Rome, he devoted himself to the diffusion of political enlightenment and patriotic aspirations among the masses of the Roman population. The pope sanctioned his political labor, and appointed him almoner of a body of 16,000 Roman troops, who volunteered for the campaign of Lombardy 1848. The Roman legion having been recalled by the pope, Gavazzi continued in Florence, Genoa, and Bologna to agitate in favor of the national movement. On the establishment of the republic at Rome, he was appointed almoner-in-chief to the national army. Under his superintendence, efficient military hospitals were organized and attended by a band of Roman ladies, who volunteered their services and co-operation in the care of the wounded. Rome having fallen, Gavazzi escaped to England, where, and later in Scotland, he delivered numerous addresses and lectures, illustrative of the political and religious aims of his country. In 1851, Gavazzi published his *Memoirs* in English and Italian: and, a few months later, a selection of his *Orations*. From Scotland he went to the United States, where he was rather coldly received; and when he went to Canada his public appearances, with his fiery and impassioned oratory, often strongly denunciatory of the papal claims, on more than one occasion nearly caused a riot. Gavazzi was with Garibaldi at Palermo during the expedition of 1870. He repeatedly visited England and Scotland, preaching and lecturing in aid of the (Prot.) Free Christian Church of Italy, which he had established. He again visited the United States 1873 and 80, delivering lectures in favor of this organization. Recently this church had so increased that it had 72 places of worship in Rome, Milan, Turin, Bologna, Naples, Venice, Florence, and many smaller cities, and over 2,000 communicants.

GAVE, *gāv*, pt. of GIVE, which see.

GAVEL-KIND, n. *găv'ĕl-kīnd* [W. *gafael*, a holding;

cenedl, a kindred, a clan: Ir. and Gael. *gabhail-cine*—from *gabh* to receive, to hold; *cine*, a tribe, a family]: in *old Eng. law*, a custom in Kent, Wales, and parts of Northumberland, and still in force in Kent, by which land descended to all the sons. Some recent investigators, as Elton in his *Origins of English History* (1881), think that Gavelkind, also Borough English (q.v.), and similar divergencies from ordinary English usage, may be derived, not from Celtic, but from Euskarian or pre-Aryan usage. It seems to be the general opinion of legal antiquaries (Selden, *Analect.* 1, 2, c. 7; Stephen, I., 213) that Gavel-kind prevailed over the whole kingdom in Anglo Saxon times, and that in Kent and elsewhere it was among the 'liberties' which the people were permitted to retain at the Conquest.

GAVESTON, *găv'ĕs tón* PIERS, favorite of Edward II., king of England: d. 1312, June 19. He was a Gascon by birth, and on account of his father's services to Edward I. was chosen companion to the Prince of Wales, over whom he acquired a complete and very mischievous ascendency, wasting his resources, and breeding dissension between him and his father. Edward I. banished him in 1307, but died the same year, and Edward II. at once recalled him, made him Earl of Cornwall, and gave him in marriage his niece, Margaret de Clare. Intoxicated with his elevation and honors Gaveston became intolerably insolent and exasperated the nobles. He was again banished, again recalled, and, the barons having declared war, was captured, and executed near Warwick.

GAVIAL, n. *gā'vĭ-ăl* [an Indian name], (*Gavialis*): genus of reptiles of the crocodile (q.v.) family, conspicuously differing from true crocodiles and from alligators in the great length and slenderness of the muzzle. Another peculiar character is a large cartilaginous swelling at the extremity of the muzzle in the males, around the orifice of the nostrils; this probably gave rise to Ælian's statement that the crocodile of the Ganges had a horn at the tip of its snout. The teeth are very numerous, about 120; they are more equal in size than those of the other animals of this family, though some of the first are rather larger than the rest, the longest of the lower jaw being received into notches in the upper, as in the true crocodiles. The head is very broad, the narrow muzzle begins abruptly, and in it the branches of the bone of the lower jaw are united and prolonged as one. There are two great perforations in the bones of the skull behind the eyes, externally marked by depressions. The plates which cover the back and the nape of the neck are united. The crest of the tail is much elevated; the feet are webbed to the extremity of the toes, the habits are aquatic as those of the crocodile of the Nile. The only perfectly ascertained species, *G. Gangeticus*, inhabits the Ganges. It attains a greater size than any other of the recent *Crocodilidæ*, frequently attaining the length of 25 ft.; but owing to the slenderness of its muzzle, it is esteemed less dangerous than a true crocodile of smaller

size. The form of the muzzle seems to adapt it for preying on fish. Fossil gavials, different from existing species have been found in Eocene deposits, as at Bracklesham, England.

GAVILAN Mountains, *gâ-vē lân′*, a chain of hills in Monterey co., Cal., not far from the coast. Mt. Pacheco, highest point, has an elevation of 2,500 ft. above sea-level.

GAVINANA, or Cavinana, small village picturesquely situated amid the Tuscan Apennines, in the valley of the river Lima; notable for the battle around its walls 1530, between the republican forces of Florence, led by their great captain, Ferruccio, and the imperialists headed by Philibert, Prince of Orange. The Florentines were defeated with the loss of their commander, and the death of Ferruccio, whose name in Tuscany has become synonymous with chivalry and patriotism, gave the final blow to the liberties of the republic.

GAVOTTE, *ga-vŏt′*: piece of music of lively character, suitable for dancing, but adapted for the stage rather than for private performance. It consists of two repetitions of eight bars each, beginning with an up-beat, and is in allabreve time. The G. was originally a dance of the Gavots, the inhabitants of Gap, in the dept. of Hautes Alpes, France —a lively but dignified peasant dance, not unlike a minuet. It was popular from the 16th to the 18th centuries, and even found favor at court. Formerly the Gavotte was often introduced into sonatas and other pieces, where its form was not so strictly adhered to; still the eight bar repetition was always considered necessary. The gavottes of Bach and Mozart are among the most charming of their minor compositions.

GAWK, n. *gawk* [AS. *geac;* Icel. *gaukr;* Scot. *gowk;* Ger. *gauch*, a cuckoo, a simpleton]: a fool; a simpleton. Gawky, a. *gaw′kî*, awkward; clownish; foolish; ungainly.

GAWLIN, n. *gaw′lĭn* [etym. doubtful]: species of seafowl.

GAY, a. *gā* [F. *gai;* It. *gajo*, merry, jolly: Sp. *gayar*, to variegate]: merry; sportive; airy and cheerful; fine; showy; addicted to pleasure and loose in conduct. Gay′ly, or Gai′ly, ad. *-lĭ*. Gayety, or Gaiety, n. *gā′ĭ tĭ*, merriment; airiness with cheerfulness. Gay′ness, n. gayety; finery. Gay′some, a. *-sŭm*, full of gayety. Gay-feather, popular name of a bulbous-rooted plant with showy purple flowers, a strong taste, and some medicinal properties—the *liatris scariosa*, also *spicata;* indigenous to America.—Syn. of 'gay': cheerful; sprightly; mirthful; jovial; lively; vivacious; gleeful; blithe; blithesome; airy; sportive; frolicsome; jolly; bright; animated.

GAY, Delphine: see Girardin, Émile de.

GAY, *gā*, Edward, American painter: b. Dublin, Ireland, 1838. He came to the United States in 1848, studied art in Albany, N. Y., and as a pupil of Schirmer and Lessing

at Carlsruhe; established a studio in New York; and was elected an associate of the National Academy of Design in 1868. In 1887 he obtained the Metropolitan prize for his picture *Broad Acres*, now in the Metropolitan Museum, New York. His works have been prominent in exhibitions of the Water Color Society and the National Academy, and include: *Washed by the Sea*; *The Suburbs*; *Where Sea and Meadow Meet* (Executive Mansion, Albany); *The Waving Grain*, etc.

GAY, JOHN: 1688-1732, Dec. 4; b. Barnstaple, Devonshire, England. Although of ancient family, his father was in reduced circumstances, and Gay was apprenticed to a London silk mercer, but disliking his occupation, he was finally released from it by his master. He published several poems, and comedies, and a volume of Fables—all now neglected; was sec. (1712) to the Duchess of Monmouth; afterward (1714) to Lord Clarendon, envoy-extraordinary to Hanover; published his poems by subscription 1720, and at the suggestion of Swift (1726) produced a 'Newgate Pastoral', *The Beggars' Opera*, which had immense popular success, starting with a run of 63 nights. Soon afterward he went to reside with the Marquis of Queensberry. His burial was in Westminster Abbey.

GAY, SIDNEY HOWARD, American journalist and author: b. Hingham, Mass. 1814, May 22; d. New Brighton, Staten Island, N. Y., 1888, June 25. Unwilling to take the oath to support the Constitution of the United States, which fostered and protected slavery, he gave up a legal career and devoted himself to anti-slavery journalism and lecturing. He became, in 1842, editor of *The Anti-slavery Standard*, a position he retained till he joined, in 1857, the editorial staff of the New York *Tribune*, of which he was managing editor 1862–6. From 1867 to 1871 he occupied the same position on the Chicago *Tribune*, and for another two years was managing editor of the *Evening Post*. He was the author of Bryant & Gay's *Popular History of the United States*, and in 1884 wrote the life of James Madison in the *American Statesmen* series.

GAY, WALTER, American artist: b. Hingham, Mass., 1856, Jan. 22. He is a nephew of S. H. Gay (q.v.), and W. A. Gay (q.v.). At 20 he went to Paris, where he studied art under Bonnat, and he has been a frequent exhibitor at the salon. Among his paintings, which have won many medals, are *Benedicite*, now in the Museum of Amiens, France, *Las Cigarreras* (*The Cigarette Sellers*) in the Luxembourg, Paris; and canvases in the Metropolitan Museum of Fine Arts, New York, the Museum of Fine Arts, Boston, and several noted collections in Europe.

GAY, WINCKWORTH ALLAN, American artist: b. Hingham, Mass., 1821, Aug. 18. At an early age he became a pupil of Weir, professor of drawing at West Point, subsequently went to Europe, and passed five years there in study, a part of the time under Troyon in Paris. He paints exclusively in landscape. *A Scene in the White*

Mountains, a picture painted for the Boston Athenæum, is a good specimen of his method of treatment of mountain scenery. Some of his best works depict that region. But he has also painted views of Nantasket beach and rocks, which have attracted much attention, and some critics have pronounced coast scenery to be his proper specialty.

GAYA, or Gayah, or Gya, *gī'â:* dist. of Bengal, Patna div., British India; bounded n. by Patna, e. by Monghyr, s.e. and s. by Hazibagh, w. by Sháhábád districts; lat. 24° 17′—25° 19′ n., long 84° 4′—86° 5′ e. The dist. in general is a level plain, with some isolated and grouped hills, the highest having an elevation of 1,620 ft. above sea-level; is highly cultivated in the e., less fertile n. and w., and in the s. full of hills, and jungles, with great numbers of wild animals; is drained by the Son, boundary between Gayá and Sháhábád and navigable throughout the year, Pimpun, Phalgú, and Jamná rivers; and is intersected by two branches of the Son canal system. The dist. contains many Brahminical sacred places in charge of Gayawals or priests, who extort large contributions from pilgrims; the ruined city of Buddh Gayá, residence of Sakya Sinha, founder of the Buddhist religion; a tree beneath which the sage is said to have set five years in meditation till he attained to the state of Buddha; and a temple of great antiquity on the highest peak of the Baraber hills where religious fairs are held every Sep. Gayá has 7 towns containing more than 5,000 inhabitants, of which Gayá is chief. Brass utensils, black stone ornaments, pottery, and tasar silk cloth are manufactured. Gayá has an area of 4,718 sq. m. Pop. 2,350,000.

GAYA, or Gayah, or Gya: capital of the district of Gaya, in the province of Bengal; on the Phalgú, affluent of the Ganges: lat. 24° 48′ n. and long. 85° 4′ e. It contains about 85,000 inhabitants; but as it is a place of great sanctity, being the birthplace of Buddha, founder of the Buddhist religion, it is annually visited by at least 100,000 pilgrims. It consists of two towns—the older reserved for the Brahmans and their immediate dependents. Silk and cotton manufactures are carried on, but the people rely chiefly on the expenditure of the superstitious visitors, some of whom have been known to leave behind them more than $25,000.

GAYAL, *ghī'al* (*Bos Frontalis*): species of ox, found in the mountains of Aracan, Chittagong, Tipura, and Sylhet, and which has long been domesticated in these countries and in the eastern parts of Bengal. It is about equal in size to the Indian buffalo; and, like the buffalo, it carries the head with the muzzle projecting forward. The head is very broad and flat at the upper part, suddenly contracted toward the nose; with short horns, a little curved, projecting nearly in the plane of the forehead, and a very wide space between at the base. There is no proper hump, but a sharp ridge on the shoulders and fore part of

the back. The prevailing color is brown, generally dark. The Kookies keep herds of gayals, which they permit to roam at large during the day in the forests, but which return home at night of their own accord; to secure which the animals are occasionally supplied with a little salt, which has the greatest attraction for them. Their milk is extremely rich, but not abundant; the Kookies, however, do not use the milk, but rear them entirely for their flesh and skins.

GAYBINE, n. *gā'bīn:* popular name for several showy twining plants belonging to the genus *Pharbitis.*

GAY'LER, Charles, American playwright: b. New York 1820, April 1; d. Brooklyn 1892, May 28. He removed to the West, was a law pupil of Abraham Lincoln, was admitted to practice, in 1848 edited the Cincinnati *Evening Dispatch,* and in 1850 became connected with the New York press, to which he contributed for many years. He wrote for English and American production a large number of plays, according to some statements nearly 400. These include: *The Heir of Glen Avon,* his earliest attempt, produced in 1839; *Taking the Chances; Olympiana; The American Cousin at Home* (for E. A. Sothern); *Night and Morning; With the Tide; Brom Bones; The Connie Soogah; Bull Run; Inflation; Lord Tatters, Irish;* and *Fritz, our Cousin German,* his most successful work, written for J. K. Emmet and first produced at Buffalo, N. Y., in 1869.

GAYLEY, Charles Mills, American educator: b. Shanghai, China, 1858, Feb. 22. He was graduated at the University of Michigan in 1878, and became professor of the English language and literature in the University of California in 1889. His publications include: *Songs of Yellow and Blue; Guide to Literature of Æsthetics; English in Secondary Schools; Classis Myths in English Literature;* etc.

GAY-LUSSAC, *gā-lü-sâk',* Joseph Louis: 1778, Dec. 6 —1850, May 9; b. St. Léonard (Haute-Vienne): distinguished French chemist. In 1794, he was sent to Paris to prepare for the Polytechnic School; was admitted to that institution 1797, Dec. 27, and after three years was promoted to the department *Des Ponts et Chaussées.* Berthollet, then prof. of chemistry in the Polytechnic School, having recognized his zeal and talents for original research, selected him as his assistant at Arcueil, where were the govt. chemical works. The study of Dalton's *Experimental Essays,* published 1801, directed his attention to chemical physics. In 1801, he published his first Memoir, on 'the dilatation of gases and vapors;' speedily followed by others on 'the improvement of thermometers and barometers;' on 'the tension of vapors, their mixture with gases, and the determination of their density, etc.;' and on 'capillary action.' He was commissioned, in association with Biot, by the Institute of France, to make a balloon ascent, for ascertaining whether the magnetic

force existed at considerable heights, or only on the surface of the earth (see BALLOON). Alexander von Humboldt investigated with him the properties of air brought down from a height of more than 23,000 ft., and their joint Memoir to the Acad of Sciences (read 1804, Oct. 1) contained the first announcement of the fact, that oxygen and hydrogen unite to form water in the simple proportion of 100 parts by bulk (volumes) of the former to 200 parts of the latter. The simplicity of the ratio in which these gases stood to each other in their combining proportions, induced him to study the combining volumes of other gases, and thus led him to the important discovery of the *law of volumes*, announced 1808, one of the most general and important laws in the whole domain of chemistry. Davy's discoveries of potassium and sodium, by the decomposing action of the voltaic pile, having excited much attention in France, Napoleon directed Gay-Lussac and Thenard to pursue this class of researches. The results of these investigations appeared in their *Recherches Physico-chimiques*, two vols. 1811. Among the most important discoveries announced in these volumes, are a new chemical process which yields potassium and sodium much more abundantly than the voltaic pile, the determination of the composition of boracic acid both analytically and synthetically, and new and improved method of analyzing organic compounds. (Boron was, however, simultaneously discovered in England by Davy). Although the discovery of iodine (1811) is due to Courtois, it was Gay-Lussac who (1813) first described its distinctive properties, gave it the name which it now bears, and proved that it is an elementary body; he was also the first to form synthetically the compounds of iodine with hydrogen and oxygen, known as hydriodic and iodic acids. In 1815, he announced the discovery of cyanogen, which presented the first known example of a compound body (C_2N) exhibiting many properties previously believed to pertain specially to simple or elementary bodies. His Memoir on this compound, in the 95th vol. of the *Annales de Chimie*, is a model of what a complete and exhaustive chemical investigation should be. Among subjects of Gay-Lussac's subsequent investigations were the fabrication of hydrated sulphuric acid, the bleaching chlorides, the alcohols, and the alkalies employed in commerce. In 1805, he was chosen a member of the committee of arts and manufactures, established by the minister of commerce; 1818, he was appointed to superintend the government manufactory of gunpowder and saltpetre; 1829, he received the lucrative office of chief assayer to the mint, where he introduced several important chemical changes; 1831, he became a member of the chamber of deputies; 1839, he was made a peer of France. He never was active in politics, and was diligently engaged in scientific research until his last illness. For many years, he was the editor, in association with Arago, of the *Annales de Chimie et de Physique*. He died at Paris, from atrophy of the heart.

GAYNOR, William Jay, American jurist and politician; b. Whitestown, N. Y., 1851; educated at Whitestown and Boston. He removed to Brooklyn, N. Y., in 1873 and engaged in journalism while studying law. Admitted to the bar in 1875. He achieved a wide reputation through the prosecution and conviction of John Y. McKane for election frauds. He was elected to Supreme court of New York 1893, and mayor of N. Y. City, 1908.

GAZA, *gā'zâ* [Heb. 'strong'], (now called Guzzeh town in the s.w. of Palestine, about 3 m. from the sea, on the borders of the desert which separates Palestine from Egypt. It originally belonged to the Philistines, and was a place of importance at the conquest of Canaan by the Israelites. It is frequently mentioned in the story of Samson; and after many vicissitudes in the wars between the Israelites and the Philistines, it was allotted to the tribe of Judah, in whose possession it remained. In B.C. 333 Gaza was taken by Alexander the Great; and from that period to 1799, when it was taken by the French under Kleber, it has been the scene of many battles and sieges. Constantine the Great, who rebuilt the town, made it the seat of a bishop. The modern Gaza has the appearance of a collection of mere villages. It has no gates, no fortifications or defenses of any kind. The only building of interest is the great mosque, with its tall, octagonal minaret and peaked roof. Gaza has manufactures of soap and cotton stuffs; and, owing to its situation near the Mediterranean and on the caravan route to Egypt, it has a good trade both by sea and land. Pop. more than 15,000, 200 to 300 of whom are Christians, and the rest Mohammedans.

GAZA, *gâ'zâ*, Theodorus: d. 1478: Greek refugee, successor of Emanuel Chrysoloras as teacher of the Greek language and literature in the West. When his native city, Thessalonica, fell into the hands of the Turks, 1430, he fled to Italy, where he studied Latin under Victorinus of Feltre, at Mantua; after 1441, he was appointed rector of the newly established gymnasium, or high school, of Ferrara, and prof. of Greek. He was invited by Pope Nicholas V., with other learned Greeks, to Rome, and was employed in making Latin versions of Greek authors. After the death of Nicholas, King Alfonso invited him to Naples 1456; but two years later, the death of this monarch also necessitated his return to Rome, where he found a patron in Cardinal Bessarion, who obtained for him a small benefice in s. Italy, either in Apulia or Calabria: here he died at an advanced age.

Gaza has been warmly praised by subsequent scholars, such as Politian, Erasmus, Scaliger, and Melanchthon. His principal writings are his *Introductivæ Grammatices*, libri iv. (on the elements of Greek grammar, published first by Aldus Manutius, Venice, 1495, and long held in high repute), a number of epistles to different persons on different literary subjects, and a variety of important translations into Latin of portions of Aristotle, Theo-

phrastus, St. Chrysostom, Hippocrates, and other Greek writers.

GAZARI, n. *găz'a-rī* [corruption of Gr. *katharoi*, pure]. in *chh. hist.*, name given, especially in Italy, to the Paulicians and sects confounded with them.

GAZE, v. *gāz* [prov. Sw. *gasa*, to stare: Norw. *glosa*, to gaze or stare: Russ. *glaz*, eye; *glazyat'*, to stare]: to fix the eyes on steadily and earnestly; to look with eagerness and curiosity; to stare: N. intent regard; fixed look; that which is gazed on. Ga'zing, imp. Gazed, pp. *gāzd*. Ga'zer, n. *-zėr*, one who. Gaze'ful, a. *-ful*, given to gazing. Ga'zingstock, n. one gazed at, usually in an unfavorable sense. Gazehound, n. a dog that follows the chase by sight; a greyhound. At gaze, with a dazed uncertain look, implying doubt; in *her.*, said of a beast of the chase, e.g., a hart or stag, represented as affrontée or fullfaced; in a state of uncertainty as to the steps to be taken.—Syn. of 'gaze, v.': to gape; regard; look; view.

GAZELLE, n. *gă-zĕl'* [F. *gazelle;* Sp. *gazela*, a kind of antelope—from Ar. *ghazál*], (*Antilope Dorcas* or *Gazella Dorcas*): elegantly formed species of antelope, celebrated for the beauty of its eyes: about the size of a roebuck, but of lighter and more graceful form, with longer and more slender limbs, in these respects exhibiting the typical characters of the antelopes in their highest perfection. It is of light tawny color, the under parts white; a broad brown band along each flank; the hair short and smooth. The face is reddish fawn-color, with white and dark stripes. The horns of the old males are nine or ten inches long, bending outward and then inward, like the sides of a lyre, also backward at the base, and forward at the tips, tapering to a point, surrounded by 13 or 14 permanent rings, the rings near the base being closest together and most perfect. The horns of the female are smaller and obscurely ringed. The ears are long, narrow, and pointed; the eyes very large, soft, and black; there is a tuft of hair on each knee; the tail is short, with black hairs on its upper surface only, and at its tip. The gazelle is a native of the n. of Africa, and of Syria, Arabia, and Persia. Great herds frequent the northern borders of the Sahara; and notwithstanding their great powers of flight, and the resistance which they are capable of making when compelled to stand at bay—the herd closing together with the females and young in the centre, and the males presenting their horns all around—lions and panthers destroy them in great numbers. The speed of the gazelle is such that it cannot be successfully hunted by any kind of dog, but in some parts of the East it is taken by the assistance of falcons of a small species, which fasten on its head, and by the flapping of their wings blind and confuse it, so that it soon falls a prey to the hunter. It is captured also in inclosures made near its drinking-places. Although naturally very wild and timid, it is easily domesticated, and, when taken young, becomes extremely familiar. Tame gazelles are very common in the Asiatic

countries of which the species is a native; and the poetry of these countries abounds in allusions both to the beauty and the gentleness of the gazelle. It has been supposed that the gazelles of Asia may be of different species from the African, but there is reason to think that they are the same. The Ariel gazelle (*A. Arabica*) perhaps differs rather as a variety than as a species, and is even more symmetrical and graceful than the common kind. There are several species very nearly allied to the gazelle, among which is *Antilope* (or *Gazella*) *Soemmeringii*, native of Abyssinia, with the curvatures of the horns very marked and sudden. Some confusion has arisen among naturalists as to the application of the name gazelle, originally Arabic; and it has not only been given to the *leucoryx* of the ancients, a very different species, but even to the *gemsboc* of s. Africa. The true gazelle was known to the ancients, and is accurately described by Ælian under the name *dorcas*, which was given also to the roe.

GAZETTE, n. *gă-zĕt'* [It. *gazetta*, a young magpie, all manner of idle chattings, running reports; *gazzettare*, to chatter as a young magpie: also is it said that *gazette* was a Venetian coin of value less than a farthing, for which a sort of gossipping sheet was sold in Venice, and that the coin's name became transferred to the paper]: in its English acceptation, the official newspaper, in which proclamations, notices of appointments, and the like, are published by the government; said to have been published for the first time at Oxford 1665. On the removal of the court to London, the title was changed to *London Gazette*. It is now published on Tuesdays and Fridays. Under the Bankrupt Act and other statutes, certain notices are directed to be given in the *Gazette*. This name is applied often generally to any newspaper: see NEWSPAPERS. GAZETTE, v. to insert or publish in the Gazette or official paper. TO BE IN THE GAZETTE, said in England of a bankrupt whose insolvency is announced in the official paper. GAZET'TING, imp. GAZET'TED, pp. published in the gazette. GAZETTEER, n. *găz'ĕt-tēr*, a geographical dictionary (see DICTIONARY: ENCYCLOPEDIA). TO BE GAZETTED, applied in England familiarly to the official announcements of appointments, promotions, etc., in the army, navy, peerage, church, etc.

GAZOGENE, n. *găz'ō-jēn* [F. *gaz*, gas, air; Gr. *gennăō*, I produce or generate]: apparatus employed in aerating liquids for domestic use: See AËRATED WATERS.

GAZOLITE, n. *găz'o-līt* [F. *gaz*, gas; Gr. *lithos*, stone]: same as AEROLITE (q.v.).

GAZOLYTES. n. *găz'o-līts* [F. *gaz*, gas; Gr. *lutos*, soluble; *luō*, I dissolve]: name given by Berzelius to those simple substances capable by their union with other simple substances of forming permanent gases.

GAZONS, *ga-zônz'*, in Fortification: sods laid over newly made earthworks, to consolidate them and prevent the soil from rolling down.

GEAN, n. *gēn* [F. *guigne;* Sp. *guinda*]: a species of wild cherry, common in England and Scotland, of a deep purple or black when ripe.

GEAR, n. *gēr* [AS. *gearwa;* Icel. *gerfi,* whatever is required to set a thing in action]: accoutrements; harness; tackle; dress; ornaments; goods; in *OE.,* stuff; matter; subject; matters of business: V. to dress; to harness. GEAR′ING, imp.: N. harness; a series of toothed wheels for effecting and directing motion. GEARED, pp. *gērd.* IN GOOD GEAR, in good working order. OUT OF GEAR, not in working order or connection; in bad health.

GEAR′ING, in Machinery: those parts by which motion in one portion of a machine is communicated to another; consisting generally of toothed-wheels, friction-wheels, endless bands, screws, etc., or of a combination of these. When the communication between the two parts of the machine is interrupted, the machine is said to be *out of gear;* and when the communication is restored, it is said to be *in gear.* In the case of a thrashing-mill, e.g., driven by a steam-engine, the gearing usually consists of an endless band which communicates motion from the axle of the fly-wheel to that of the drum. If the band were slipped off from one wheel, or slackened so that motion could not be communicated by means of it, then the machine would be *out of gear.* Gearing which can be put in and out of gear is called *movable gearing;* and that which cannot, as, for instance, the wheel-work of a watch, is called *fixed gearing.* Gearing which consists of wheel-work or endless screws (q.v.) is put out of gear either by means of one of the wheels sliding along its axis, or being moved out of its place horizontally or vertically by means of a lever. *Straight gearing* is used when the planes of motion are parallel to each other; *bevelled gearing,* when the direction of the plane of motion is changed. Gearing has for its object also the increasing or diminishing of the original velocity, and in reference to this, is distinguished by the term 'multiplying' or 'retarding.' See WHEELWORK.

GEARY, *gā′rĭ* or *gē′rĭ,* JOHN WHITE: 1819, Dec. 30—1873, Feb. 8; b. Mt. Pleasant, Westmoreland co., Penn.: soldier. He studied a short time in Jefferson College, Penn., taught school, was a clerk in Pittsburgh, studied mathematics, civil engineering and law, and was admitted to the bar. In the Mexican war he was wounded at Chapultepec and appointed first commander of the City of Mexico and col. of the 2d Penn. regt. In 1849 he was appointed first post-master of San Francisco, and organized the postal service of the Pacific coast dist.; became first American alcade of San Francisco, and first mayor of the city under the new constitution 1850. He was in private life in Penn. 1852–56; terr. gov. of Kansas 1856–7; in private life 1857–61; raised the 28th Penn. vols. and commanded it through the Shenandoah campaign 1861; was promoted brig.gen. 1862, Apr., and maj.gen. 1863; commanded 2d div. 20th corps in Sherman's march to the

sea; was the first to enter Savannah and was appointed its milit. gov. 1864, Dec.; was elected gov. of Penn. as a republican, 1866, and re-elected 1869.

GEAT, n. *jēt* [AS. *geotan*, to pour; Low Ger. *geten*: the hole or channel through which molten metal descends into the mold.

GEBANG PALM, *gā′băng pâm* (*Corypha Gebanga*): fan-leaved palm, native of the E. Indies; one of the most useful palms of that part of the world. Its stem yields a kind of sago; its root is medicinal, being both emollient and slightly astringent, so as to be particularly adapted to many cases of diarrhœa; its leaves are used for thatch, for making broad brimmed hats, and for various economical purposes; its young leaves are plaited into baskets and bags, in the manufacture of which many of the people of Java find employment; the fibres of the leaf-stalks are made into ropes, baskets, nets, cloth, etc.—To the genus *Corypha* belongs also the Talipat Palm (q.v.).—The fruit of *C. Pumas*, a Mexican species, is eatable, and has a sweet taste.

GE′BA RIVER: see Senegambia.

GEBER: see Gheber.

GEBIR, *gā′bėr*, Abu-Mussah-Jaafer Al Sofi: founder of the Arabian school of chemistry; lived toward the end of the 8th, or the commencement of the 9th c. The place of his birth is uncertain. According to the majority of authorities he was born at Tûs, in Khorassan, but Abulfeda supports the claims of Harran in Mesopotamia. He was greatly esteemed in the East, and subsequently in Europe, where the chemists, at the time of Van Helmont, did nothing more than repeat his experiments. Cardan reckons Gebir one of the 12 subtlest geniuses of the world, while Roger Bacon bestows upon him the epithet 'magister magistrorum.' He wrote an immense number of treatises on alchemy, of which many are extant in Latin versions. The library at Leyden contains many manuscripts of Gebir's works which have never been published. In the Imperial Library at Paris are manuscripts of his two celebrated works, the *Summa Collectionis Complementi Secretorum Naturæ*, and the *Summa Perfectionis*—also of a work on Astronomy, and a treatise on Spherical Triangles. The principle laid down by Gebir at the commencement of his works is, that art cannot imitate nature in all things, but that it can and ought to imitate her as far as its limits allow. An edition of his works in Latin was published at Dantzic 1682; another in English by Russell (London 1678). For Gebir's opinion with regard to alchemy, see Alchemy.

GECARCINUS, n. *jē-kâr-sī′nŭs* [Gr. *gē*, land; *karkinos*, a crab]: land crab, typical genus of *Gecarcinidæ*, a family of short-tailed crustaceans, containing various tropical land crabs. At a certain season they migrate in numbers to the sea, to deposit their eggs.

GECINUS, n. *jē-sī′nŭs* [Gr. *gē*, the earth; *kineō*, I move]: typical genus of the sub-family *Gecininæ:* see WOODPECKERS.

GECK, n. *gĕk* [AS. *geac*, a cuckoo]: in *EO.*, a fool; a simpleton; an object for jesting.

GECKO, n. *gĕk′kō* [imitative of the sound which the animal utters], (*Gecko*): genus of saurian reptiles, constituting a family, *Geckotidæ*, which some recent naturalists have divided into many genera. The geckoes are of small size, and generally of repulsive aspect; the colors of most of them are dull, and the small granular scales with which they are covered are in general mingled with tubercles. The legs are short, the gait usually slow, measured, and stealthy, although geckoes can also run very nimbly when danger presses, and often disappear suddenly when they seem almost to be struck or caught. The feet are remarkable, being adapted for adhering to smooth surfaces, so that geckoes readily climb the smoothest trees or walls, or creep inverted on ceilings, or hang on the lower side of the large leaves in which tropical vegetation abounds. The body and tail are never crested, but are sometimes furnished with lateral membranes, variously festooned or fringed. The lateral membrane is sometimes even so large as to be of use to arboreal species in enabling them to take long leaps from branch to branch. The geckoes feed chiefly on insects. They are more or less nocturnal in their habits. They are natives of warm climates, and are widely distributed over the world. Two species are found in s. Europe, both of which frequently enter houses, as do the geckoes of Egypt, India, and other warm countries. Some of them are described as enlivening the night in tropical forests by a harsh cackle. The geckoes have, in almost all parts of the world where they are found, a bad reputation as venomous, and as imparting injurious qualities to food which they touch, but there is no good evidence in support of any such opinion, in accordance with which, however, an Egyptian gecko is even known as *the father of leprosy*.

GEDDES, *gĕd′ĕs*, ALEXANDER, LL.D.: biblical critic, translator, and miscellaneous writer: 1737–1802, Feb. 26; b. Arradowl, parish of Ruthven, Banffshire, Scotland. His parents were Rom. Catholics, and young Geddes was educated for a priest, first at Scalan, a monastic seminary in the Highlands, subsequently at the Scots College, Paris, where he learned Hebrew, Greek, Italian, French, Spanish, German, and Low Dutch. In 1764, he returned to Scotland, and, having taken orders, was appointed officiating priest to the Rom. Catholics of Angus, but after a short time went to reside with the Earl of Traquair. In 1769, he took charge of a Rom. Cath. congregation at Auchinhalrig, Banffshire, where he remained ten years, honorably conspicuous by his charities and extraordinary liberality of sentiment. He was at length deposed from all his ecclesiastical functions, on account of his occasional

attendance at the parish church of Cullen, between the minister of which and himself there existed an intimate acquaintance. Geddes then betook himself to literature, and went to London 1780. He had long planned a translation of the Bible into English for the use of Rom. Catholics, and he was, through the munificence of Lord Petre, enabled to devote himself to the work. After various preliminary publications intended to pave the way for an impartial or favorable consideration of his *magnum opus*, there appeared 1792, *The first volume of the Holy Bible, or the Books accounted Sacred by Jews and Christians, otherwise called the Books of the Old and New Covenants, faithfully translated from Corrected Texts of the Originals, with Various Readings, Explanatory Notes, and Critical Remarks.* In 1793, the second vol. was published, carrying the translation as far as the end of the historical books; and in 1880, a third vol. containing his *Critical Remarks on the Hebrew Scriptures.* The opinions enunciated in these volumes, especially in the last, are startlingly heretical, more especially when the training of their author is considered, and were calculated at the time of their appearance to offend both Rom. Catholics and Protestants. They exhibit as thorough Rationalism as is to be found in Eichhorn or Paulis. Moses is said to be inspired in the same sense as other good men; and in regard to his purpose, it is affirmed that 'he only did what all other ancient legislators had done—required a greater or less degree of implicit obedience to their respective laws, and for that purpose feigned an intercourse with the Diety, to make that obedience more palatable to the credulous multitude.' Miracles are explained away; and the account of the creation in Genesis is described as 'a most beautiful mythos or philosophical fiction, contrived with great wisdom, and dressed up in the garb of real history.' These opinions naturally exposed him to the charge of infidelity, and his criticisms were described as 'less scurrilous, perhaps, but not less impious than those of Thomas Paine.' All sorts of ecclesiastics united in their condemnation, and the undoubted effect of their hostility was to crush whatever hopes of literary fame Geddes may have entertained. He died at London. It is now generally admitted, even by those who utterly reject Geddes' views, that his translation is in the main excellent. His labors have unquestionably advanced the science of Biblical Criticism. See Life of Geddes by Good (1803).

GEDDES, Janet (known in Scottish ecclesiastical history as 'Jenny Geddes'): elderly woman said to have been prominent in resisting the introduction of the Service-book prepared by Laud, in the Church of Scotland. 1637, July 23, Sunday, was the day fixed for this innovation, so obnoxious to the Scottish Presbyterians; and an immense crowd filled the High Church of St. Giles, Edinburgh. On the Dean of Edinburgh beginning to read, his voice was lost in a tumultuous shout, and (the story is) an old

woman, said to have been one Jenny Geddes, who kept a green-stall in the High Street, bawling out; 'Villain! dost thou say mass at my lug?' (ear), launched her stool at the dean's head. Universal confusion ensued, and the dean, throwing off his surplice, fled, to save his life. The Bp. of Edinburgh, on attempting to appease the storm, was assailed by a volley of sticks, stones, and other missiles, accompanied by cries and threats that effectually silenced him. This tumult proved the deathblow of the liturgy in Scotland. It has been doubted, however, if there ever was such a person as Jenny Geddes. In 1756, a citizen of Edinburgh, of the name of Robert Mein (d. 1776), published a tract in which he claims the exploit of Jenny Geddes for his great grandmother, 'the worthy Barbara Hamilton, spouse to John Mein, merchant and postmaster in Edinburgh, who, in 1637, spoke openly in the church at Edinburgh against Abp. Laud's new Service-book, at its first reading there, which stopped their proceedings, and dismissed their meeting, so that it never obtained in our church to this day.'

GEE, v. impera. *j̇ē* [AS. *gegan*, to go: It. *gio*, get on, addressed to a horse]: an exclamation by the driver of a cart or wagon, and the like, ordering his horse to get on, or go faster. GEE-HO, *j̇ē-hō′*, an order to the horse to turn in a direction away from the driver.

GEEFS, *gāfs* or *ċhāfs*, GUILLAUME: 1806, Sep. 10—1860, b. Antwerp: Belgian sculptor. After studying there, he went to Paris, which he quitted during the revolution of 1830, returning to Belgium, and executing at Brussels a monument to the memory of the victims of the revolution of 1830. The most important of his other works are: *Colossal Marble Statue of King Leopold; Monument to Count Frederic de Merode*, now in the cathedral of Brussels; and *Statue of General Belliard*. He executed a group entitled *Le Lion Amoureux*, which was shown at the exhibition in Paris (1855).—JOSEPH GEEFS, younger brother of Guillaume (b. 1808, Dec. 25; d. 1888, Oct. 10), also had a reputation as a sculptor. He executed a number of statues, of which two, *Metabus* and *Thierry Maertens*, were shown at the Exhibition 1855. In general character, his works resemble those of his brother.—ALOYS GEEFS (d. 1841), youngest brother of Guillaume, also is known as a sculptor by means of his *Epaminondas Dying*, *Beatrix*, and the bas-reliefs for the *Rubens* of his eldest brother.

GEEL, *ċhāl*, JAKOB: 1789–1862, Nov. 11; b. Amsterdam: Dutch scholar. He was educated at the Athenæum of that city; lived at The Hague from 1811 as a family tutor; became second librarian at Leyden 1823, and head-librarian and honorary prof. 1833. He had made himself known as a philologist by editions of Theocritus, with the *Scholia* (1820), of the *Anecdota Hemsterhusiana* (1826), of the *Scholia in Suetonium* of Ruhnken (1828), of the *Excerpta Vaticana* of Polybius (1829); and

his *Historia Critica Sophistarum Græcorum* (1823) had called forth several treatises on the same subject from German philologists. In 1840, appeared his edition of the *Olympicus* of Dio Chrysostom, accompanied by a *Commentarus de Reliquis Dionis Orationibus;* and in 1846 he issued the *Phœnissæ* of *Euripides*, with a commentary in opposition to Hermann. All these works are models of scholarship, taste, and method. Geel, with others, established the *Bibliotheca Critica Nova*, 1825. The national literature is indebted to him not only for the translation of German and English works into Dutch, but also for original treatises on various æsthetical subjects. He won the gratitude of the learned throughout Europe by his valuable *Catalogus Codicum Manuscriptorum qui inde ab Anno;* 1741 *Bibliothecæ Lugduni Batavorum, accesserunt* (1852).

GEELONG, *gē lawng':* flourishing city of Victoria, in Australia, 38° 10′ s. lat., and 144° 21′ e. long.; picturesquely situated on the s. side of Corio Bay, 45 m. s.w. of Melbourne. It is well laid out, abounds in attractive shops, and has some handsome buildings. It is on the Victorian railway. The river Barwon forms the s. boundary of the city, and 3 m. farther spreads into the Connewarre Lakes, falling into the sea at Point Flinders. The discovery of gold-fields in the neighborhood 1851 added to the prosperity of Geelong, which had become a principal seat of the wool trade. The first woolen mill in Victoria was erected in Geelong, and the govt. award of £1,500 gained. Alongside of the railway jetty, 1,000 ft. long, the largest ships can load and discharge, and there are three other jetties for smaller vessels. Through the bar at the entrance to Corio Bay, a channel has been dredged to a depth of 21 ft. 6 inches, at a cost of £60,000. The district is exceedingly fertile, and the Barrabool Hills on the w. bank of the Barwon are covered with farms, orchards, and vineyards. Limestone and a kind of marble are found in the neighborhood. There are various industries carried on, especially the manufacture of woolen cloths, meat preserving, tanning, fishing, etc. The city is lighted with gas, and supplied with water from the river, and has an excellent hospital, several asylums, a chamber of commerce, mechanics' institute, botanical garden, public park, grammar school, and newspapers. Pop. 25,000.

GEESE, n.: plu. of Goose, which see.

GEESTEMÜNDE, *gās'tėh-mün-dėh:* seaport, dist. of Stade, prov. of Hanover, Prussia, at the mouth of the Geeste river, affluent of the estuary of the Weser which separates it from Bremerhafen; 32 m. n. of Bremen; terminus of the Geestemunde and Bremen railroad. It was founded by Hanover as a rival of Bremerhafen, was made a free port 1847, and is noted chiefly for its naval and commercial importance. The construction of its grand harbor was begun 1857, and involved the creation of a

great basin, 1,785 English ft. long, 410 ft. wide, and 23 ft. deep, opened 1865; a basin for petroleum shipping, 820 ft. long and 147 ft. wide, opened 1874; a canal on the e. of the great basin, 13,380 ft. long and 155 ft. wide, with a branch of similar proportions and powerful fortifications. Since the annexation of Hanover to Prussia, Geestemünde has been made a German naval station.

GEEZ: See ETHIOPIA: AMHARIC.

GEFFRARD, *zhā-frâr'*, FABRE: 1806, Sep. 19—1878, Dec. 31; b. L'Ause à Veau, Hayti: soldier and president. He was the son of Gen. Nicolas Geffrard, one of the founders of Haytian independence, was adopted by Col. Fabre, and educated in the college of Aux Cayes, enlisted as a private soldier, became lieut.col. and occupied Jeremie 1843, was promoted col. and defeated the troops of Pres. Boyer near Jacmel, was appointed brig.gen. and commander of Jacmel 1844, subdued a rebellion under Gen. Achaau and became gen. of division 1845, and was active in the Dominican expedition 1849. Soulouque, as emperor Faustin I., made him lieut.gen. and duke of Tabaro, and fearing his popularity deprived him of his command 1858. This led to an uprising in which a republic was proclaimed under the presidency of Geffrard and Soulouque banished. Geffrard was pres. 1858, Dec. 22—1867, Feb. 22, when he was banished and retired to Jamaica.

GEFLE, *yĕv'lā:* important town of Sweden, chief town of the læn Gefleborg, at the mouth of the river Gefle, on an inlet of the Gulf of Bothnia, about 100 m. n.n.w. of Stockholm. The stream upon which it stands is divided into three branches, forming two islands, united by bridges with the right and left banks of the river and forming portions of the town. Gefle ranks third among commercial towns of Sweden, Stockholm and Göteborg alone having more extensive trade. The chief buildings are a gymnasium; a castle, imposingly situated; a court-house, one of the finest in Sweden; a good public library, and an excellent harbor. Gefle carries on ship-building and has manufactures of sailcloth, linen, leather, tobacco, and sugar. Its exports are iron, timber, tar, flax, and linen; its imports chiefly corn and salt. Pop. 30,146.

GEHENNA, n. *gē-hĕn'nă* [Gr. form of Heb. *Ge-hinnom*, 'Valley of Hinnom,' or *Ge-ben-Hinnom*, Valley of the Son of Hinnom]: valley or gorge, very narrow, with steep and rocky sides, s. and w. of the city of Jerusalem. Here Solomon built a high place for Molech (I. K. xi, 7), and it became a favorite spot with the later Jewish kings for the celebration of idolatrous rites. It was here that Ahaz and Manasseh made their children pass through the fire to Moloch, 'according to the abomination of the heathen;' and at its s.e. extremity, specifically designated Tophet ('place of burning'), the hideous practice of infant sacrifice to the fire-gods was not unknown (Jer. vii, 31). When king Josiah came forward as the restorer of the old and pure national faith, he 'defiled' this place of idolatry by

casting into it human bones; and after this it appears to have become 'the common cesspool of the city, into which sewage was conducted, to be carried off by the waters of the Kidron, as well as a laystall, where all its solid filth was collected. Hence, it became a huge nest of loathsome insects, whose larvæ or "worms" fattened on the corruption.' It is said that fires were kept constantly burning here, to consume the bodies of criminals, the carcasses of animals and whatever other offal might be combustible. Among the later Jews Gehenna and Tophet came to be regarded as symbols of hell and torment, and in this sense Gehenna is employed by Christ in the New Testament: e.g., Mk. ix. 47, 48: 'It is good for thee to enter into the kingdom of God with one eye, rather than having two eyes, to be cast into Gehenna; where their worm dieth not, and the fire is not quenched.'

GEIBEL, *gī'bėl*, EMANUEL: popular poet of Germany: b. Lubeck, 1815, Oct. 18. He studied at the Univ. of Bonn, and 1836 went to Berlin. Two years afterward he obtained the tutorship in the family of the Russian ambassador at Athens, where he still prosecuted his studies. On his return to Lübeck 1840, he worked up the material he had collected in Greece, and studied Italian and Spanish literature. Soon after the publication of his first poems, a pension of 300 thalers a year was bestowed on him by the king of Prussia. Geibel resided alternately at St. Goar with Freiligrath, at Stuttgart, Hanover, Berlin, and Lübeck; till, 1852, he was appointed prof. of æsthetics in the Univ. of Munich by the king of Bavaria. He retired to Lübeck 1868. With Curtius, he published his *Classische Studien* (1840) containing translations from the Greek poets. These were followed in the same year by his *Gedichte* (82d edit. 1877), the beauty and religious tone of which made them at once great favorites with the Germans. The results of his Spanish studies were the *Spanischen Volkslieder und Romanzen* (Berlin 1843), followed by the *Spanische Liederbuch* (Berlin 1852), published in conjunction with Paul Heyse. In 1857, appeared his tragedy *Brunehilde*, and in 1864, *Gedichte und Gedenkblätter*. In 1868 he published another tragedy called *Sophonisbe*. His poems are distinguished by fervor and truth of feeling, richness of fancy, and a certain pensive melancholy, and have procured him a popularity—especially among cultivated women—such as no poet of Germany has gained since Uhland. D. 1884, Apr. 6.

GEIC, a. *jē'ĭk* [Gr. *gē*, the earth]: earthy; pertaining to or derived from the earth; terrene.

GEIC ACID, *jē'ĭk* [Gr. *gē*, or *geiă*, the earth]: an acid obtained from earth; a constituent of vegetable mold.

GEIGER, *gī'gėr*, ABRAHAM: 1810, May 24—1874, Oct.; b. Frankfurt-on-the-Main: Jewish scholar. According to old rabbinical practice, his teachers were his father and elder brother till he reached the age of eleven. After that, having received an advanced education for some

years, he went, 1829, to the Univ. of Heidelberg, and shortly afterward to that of Bonn, for the study of philosophy and of the Oriental languages. 1832, Nov., he was called as rabbi to Wiesbaden, and there, under the impulse to the scientific study of Judaism which proceeded from Berlin, he applied himself to Jewish theology, especially in its relation to practical life. In 1835, he joined with several able men in editing the *Zeitschrift für Jüdische Theologie*. The spirit of inquiry, however, with which he discussed prevalent opinions and usages, brought him into collision with the conservative Jews, especially after 1838, when he became assessor of the rabinate at Breslau; but the great majority of educated men in his sect continued attached to him. He gave the first impulse to the celebrated assemblies of the rabbis, three of which have been held since 1844 at Brunswick, Frankfurt-on-the-Main, and Breslau. At the second of these he was vice-pres., and pres. at a third. Though Geiger was thus active in the reform movement, he could not abandon his historical point of view, which made him unwilling to break entirely with the past; therefore he refused a call to be preacher to the Berlin Reform Society. Besides sermons, pamphlets, and numerous contributions to the above mentioned periodical, Geiger published historical monographs, distinguished by thoroughness of investigation and many-sided learning: among these are *Melo Chofnajim* (Berlin 1840), on Joseph Salomo del Medigo, and the *Nite Naamanim* (Berlin 1847), on the exegetical school of n. France. His *Lehr- und Lesebuch zur Sprache der Mischna* (1845) is of great value to the Oriental philologist. In 1850 appeared the first number of *Studien* on Moses-Ben-Maimon; and 1851, a translation of the *Divan of the Castilian Abu'l-Hassan Juda ha-Levi*, accompanied by a biography of the poet and explanatory remarks. Besides some specimens of Jewish mediæval apologetics, and numerous articles in the reviews, Geiger published *Urschrift und Uebersetzungen der Bibel in ihrer Abhängigkeit von der inneren Entwickelung des Judenthums* (1857); *Das Judenthum und seine Geschichte* (1864–1865); *Unser Gottes-dienst* (1868); *Israel Gebetbuch*, etc. 1863–70 Geiger was rabbi in Frankfurt; thence until his death in Berlin.

GEIJER, *yī'ėr*, Eric Gustaf: 1783–1847; b. Ransätter, in the Swedish læn of Wermland: historian. He was sent, at the age of 16, to the University of Upsala; applied himself to the history of his native country; was nominated to a post in the Chamber of the National Archives, and 1810 was elected assistant to Fant, prof. of history in the University of Upsala, succeeding to the chair on Fant's death, 1817. Geijer's early lectures were listened to by crowds of students and of the general public; but at a subsequent period, his popularity diminished in proportion to the increased profundity of his views; while the suspicion that he harbored skeptical notions in regard to the Trinity, brought him into disfavor with a portion

of the community. The examinations to which charges against him gave rise terminated in his acquittal, and were even followed by the offer of the bishopric, which he declined. Geijer was poet as well as historian, and according to the testimony of his countrymen, his *Sista Skalden, Vikingen, Odalbonden,* and other heroic pieces, place him in the foremost rank of Swedish poets. He and his friends Alderbeth, Tegner, and Nikander, adhered to the 'Gothic' school of poetry, which they furthered by the establishment of 'the Society of the Goths' as early as 1810, with its magazine entitled *Iduna,* in which appeared several of Geijer's best poems, and among other productions of merit, the early cantos of Tegner's *Frithiof.* Unfortunately Geijer did not complete any one of the vast undertakings which he planned: *Svea Rike's Häfder,* or Records of Sweden, intended to embrace the history of the country from mythical ages to the present time, did not proceed beyond the introductory volume. His next work, *Svenska Folkets Historia,* intended to form one of the series of European histories, edited by Leo and Uckert, was not carried beyond the death of Queen Christina; yet these incomplete works rank among the most valuable contributions to Swedish history. To Geijer was intrusted the task of examining and editing the papers which Gustavus III. had bequeathed to the Univ. of Upsala, with the stipulation that they were not to be opened for 50 years after his death: they appeared 1843, but were found of no value. During the last ten years of his life, Geijer was active in politics; but his versatility prevented him from applying his powers methodically to the complete elaboration of any one great object. Geijer was a musician and composer of no mean order. His numerous letters to his friend King Bernadotte, form part of the *Samlade Skrifter,* or collective works, which, with a biographical sketch, was published 1853.

GEIKIE, *gē'kė,* ARCHIBALD, LL.D., F.R.S.: geologist: b. Edinburgh, 1835. He was educated in the Edinburgh Univ., appointed to the geol. survey 1855, was associated with Sir Roderick Murchison in his geol. work in the Scottish highlands, was appointed director of the geol. survey of Scotland 1867, became first occupant of the chair of geol. and mineralogy in the Edinburgh Univ., founded by Sir Roderick Murchison and the Crown 1870, and was appointed director-gen. of the geol. survey of the United Kingdom, and director of the Museum of Practical Geol., London, 1881. He is a fellow or member of various scientific bodies, received the degree LL.D. from St. Andrews Univ. 1872, and from Edinburgh Univ. at its tercentenary celebration 1885, and is author of numerous works on geol. subjects.

GEIKIE, CUNNINGHAM, D.D.: clergyman and author: b. Edinburgh, Scotland, 1826, Oct. 26. He was educated at the Univ. of Edinburgh and Queen's College, Toronto, was pastor of the Argyle street Presb. Church, Halifax, 1851–

54, Argyle street Presb. Church, Sunderland, England, 1860–67, and of Islington Chapel, London, 1867–73. In 1876 he was ordained deacon in the Church of England, and priest 1877; was curate of St. Peters, Dulwich, near London 1876–79, rector of Christ Church, Paris, 1879–81, vicar of St. Mary Magdalene, Barnstable, 1882–85, and since 1885 has been vicar of St. Martin-at-Palace, Norwich. His writings embrace *The Backwoods of Canada* (1864); *Great and Precious Promises* (1872); *Life and Words of Christ* (1877); *Old Testament Portraits* (1878); *Hours with the Bible,* 6 vols., covering the Old Test. 1880–85; *The English Reformation* (1884); *Landmarks of Old Testament History* (1895); *A New Short Life of Christ* (1898); *The Vicar and His Friends* (1901); etc. He received the degree D.D. from Queen's University, Kingston, Canada, 1871. He is a clear and graphic writer, diligent in study of his subject; therefore interesting and instructive: his *Life of Christ,* and *Hours with the Bible,* have had immense circulation in Britain and America. D. 1906, Apr. 1.

GEIKIE, JAMES: a Scottish geologist; b. 1839, Aug. 23, brother of Sir Archibald Geikie; received a collegiate education; served on the Geological Survey of Scotland, 1861–82. In the latter year he succeeded his brother as prof. of geology in Edinburgh University. His publications include *The Great Ice Age; Prehistoric Europe; Outlines of Geology; Earth Sculpture;* a translation of *Songs and Lyrics by H. Heine and other German Poets, etc.*

GEISHA, *gā'sha,* a Chino-Japanese word meaning 'one with pleasing accomplishments,' applied to Japanese singing and dancing girls who furnish entertainment in tea-houses and at social gatherings.

GEISSLER, HEINRICH, *hīn'rĭh gīs'lĕr,* German mechanician: b. Igelshieb, Germany, 1814, May 26; d. Bonn, Prussia, 1879, Jan. 24. He became known as a maker of physical and chemical apparatus and principally as the inventor of Geissler's tubes (q.v.), an apparatus for producing light by an electric discharge in vacuo.

GEISSLER'S TUBES, tubes made of very hard glass, and containing highly rarified gases. Each end of the tube has a platinum wire sealed into it to serve as electrodes. When a discharge of electricity is caused to take place in these tubes by connecting the electrodes to the terminals of a Ruhmkorff's coil or a Holtz's machine, very brilliant, luminous effects are produced. The invention was named after Heinrich Geissler (q.v.).

GEITONOGAMY, n. *gī'tŏn-ŏg'ă-mĭ* [Gr. *geitōn,* neighboring, contiguous; *gamos,* marriage]: the fecundation of a flower by pollen from other flowers of the same plant.

GEK'KO. See GECKO.

GELA, *jē'la:* in ancient times, a very important town, on the s. coast of Sicily, on the river Gela. It was founded by a Rhodian and Cretan colony B.C. 690. Its rapid

prosperity may be inferred from the fact that as early as B. C. 582 Agrigentum was founded by a colony from Gela. After Cleander had made himself tyrant B.C. 505 the colony reached its highest power under his brother Hippocrates, who subdued almost the whole of Sicily, with the exception of Syracuse. Gelon, successor of Hippocrates, pursued the same career of conquest, and Syracuse itself fell into his hands, and was made his principal residence, Gela being committed to the government of his brother Hiero. At Gela Æschylus died and was buried B.C. 456. During the Carthaginian wars it suffered greatly, but its ruin was completed by Phintias of Agrigentum, before B.C. 280.

GELADA, *gĕl'a-da*, a kind of baboon.

GELALÆAN ERA, n. *jĕl-a-lē'an ē'ra* [named after *Gelal-u-Din*, Sultan of Khorassan]: era introduced by Gelal-u-Din, commencing 1079, March 4.

GELASIMUS, n. *jē-lās-ĭ-mŭs* [Gr. *gelasimos*, laughable—from *gelaō*, I laugh]: the calling crab, so named because they put out one of their claws, which is proportionately very large, as if they beckoned another animal to come to them, their real intention being, however, to threaten. They belong to the tribe *Brachyura* (short-tailed crustaceans). They are known as the fiddler crab.

GELASIUS, *jē-lā'shĭ-ŭs*, I., POPE OF ROME: born in Africa, succeeded Felix III. as pope 492, Mar. 1; died 496, Nov. 19. During his pontificate the canonical books of Scripture were separated from the apocryphal. He is said to have confirmed the estrangement between the eastern and western churches by insisting on the removal of the name of Acacias, Bishop of Constantinople, from the diptycles, and to have been the first pope who asserted the supremacy of the papacy, over all imperial powers and all ecclesiastical bodies. Numerous extant writings are ascribed to him, but, excepting five, are believed to be spurious. He was canonized, and his day is the anniversary of his death.

GELATIGENOUS, a. *jĕl'ă-tĭj-ĕ-nŭs* [Eng. *gelatin;* Gr. *gennăō*, I produce (see GELATIN)]: capable of producing gelatin. GELATIGENOUS TISSUES, substances resembling the proteine-bodies (albumen, fibrine and caseine) in containing carbon, hydrogen, nitrogen, oxygen, and sulphur; but differing from them in containing more nitrogen and less carbon and sulphur. They consist of two principal varieties, viz., those which yield glutin (or ordinary *gelatin*), and those which yield *chondrine*.

Glutin is obtained by more or less prolonged boiling with water, from the organic matter of bone (the *osseine* of Frémy), from tendons, skin cellular tissue, white fibrous tissue, the air-bladder and scales of fishes, calves' feet, hartshorn, etc.; while chondrine is similarly obtained from the permanent cartilages, from bone-cartilage before ossification, from enchondromatous tumors, etc. Neither glutin nor chondrine appears to exist as *such* in the

animal body, but is in all cases the result of the prolonged action of boiling water on the above-named tissues. Frémy's analysis (see his *Recherches Chimiques sur les Os*, in the *Ann. de Chim. et de Phys.*, 1855, XLIII., 51) show that osseine is isomeric with the glutin which it yields, and further, that the amount of glutin is precisely the same as that of the osseine which yields it. The following table exhibits the composition of osseine and the glutin yielded by it as determined by Frémy, and that of chondrine as determined by Mulder:

	Osseine.	Glutin.	Chondrine.
Carbon,.....	49.21	50.40	49.97
Hydrogen,.....	6.50	6.50	6.63
Nitrogen,.....	17.86	17.50	14.14
Oxygen with a little Sulphur,....	25.14	26.00	28.97

Glutin, when perfectly pure and dry, is a tough, translucent, nearly colorless substance, devoid of odor and taste. It swells when placed in cold water, and loses its translucency; but in boiling water it dissolves, and forms a viscid fluid, which on cooling forms a jelly. A watery solution containing only 1 per cent. of glutin, gelatinizes on cooling. This property is destroyed both by very prolonged boiling and by the action of concentrated acetic acid. Glutin is insoluble in alcohol and in ether. A solution of glutin is abundantly precipitated by solutions of corrosive sublimate and of bichloride of platinum, as well as by infusion of galls, of which the active principle is tannin or tannic acid (the terms being synonymous). Tannic acid produces, even in very dilute solutions, a copious yellow or buff-colored precipitate of tannate of glutin. The gelatigenous tissues unite in a similar manner with tannin; they extract it from its watery solutions, and form compounds with it which resist the action of putrefaction. It is thus that hides are converted into leather (q.v.). The tests above mentioned also precipate albumen, but glutin may be distinguished from albumen by its not being thrown down (as is the case with albumen) by the addition of ferrocyanide of potassium together with a little acetic acid. The gelatinizing property also serves to distinguish glutin when it amounts to 1 per cent. or more of the solution. On exposure to the atmosphere, glutin becomes putrid more rapidly than almost any other animal substance. Under the influence of oxydizing agents, it yields the same products as the proteine bodies; treated with the mineral acids or with alkalies, it yields Glycocine (q.v.)—known also as glycine, glycocoll, and sugar of gelatin—Leucine (q.v.), and other products. Isinglass, prepared from the air-bladder of the sturgeon, etc., when boiled with water, furnishes glutin in a nearly pure state. Glue and size are two well-known forms of impure glutin or gelatin.

Chondrine resembles glutin in physical properties, and especially in its property of gelatinizing. It differs, however, slightly from it in chemical composition (see the above table) and in behavior toward reagents. For instance, acetic acid, alum, and the ordinary metallic salts

of silver, copper, lead, etc., which produce no apparent effect on a solution of glutin, throw down a precipitate from a solution of chondrine; while, on the other hand, corrosive sublimate, which precipitates glutin freely, merely induces a turbidity in a solution of chondrine.

Little is known regarding the physiological relations of these substances. Glutin (according to Scherer) exists usually in the juice of the spleen, but in no other part of the healthy animal body; it is found sometimes in the blood in cases of leucocythæmia, in pus, and in the expressed juice of cancerous tumors. Chondrine has been found in pus. The gelatigenous tissues rank low in the scale of organization, and their uses are almost entirely physical. Thus they form strong points of connection for muscles (the tendons), they moderate shocks by their elasticity (the cartilages), they protect the body from rapid changes of temperature by their bad conducting power (the skin), and they are of service through their transparency (the cornea).

GELATIN or GELATINE, n. *jĕl′ă-tĭn* [F. *gélatine*—from mid. L. *gelatīna*—from L. *gelātŭs*, congealed; *gĕlū*, icy coldness]: nitrogenous substance, forming glue, size, and isinglass, found in animals, chiefly in their connective tissues, but not found in vegetable substances; animal jelly; glue; glutin. GELATINOUS, a. *jĕ-lăt′ĭ-nŭs*, resembling or consisting of jelly. GELAT′INATE, v. *-ĭ-nāt*, or GELAT′INIZE, v. *-nīz*, to convert into jelly; to assume the form of jelly. GELAT′INATING, imp. GELAT′INI′ZING, imp. GELAT′INATED, pp. GELAT′INIZED, pp. *-nīzd*. GELAT′INA′TION, n. *-nā′shŭn*, the act or process of converting into gelatin.—Gelatin is a term which though usually applied to only one variety of the substance, properly denotes also ISINGLASS (q.v.) and GLUE (q.v.), which are modifications of the same material. Vegetable jelly also is analogous.

GELATIN (proper) is animal glutin prepared from the connective tissues or from the bones of animals. When the tissues are used, the usual method is to cut them into small pieces and soak them in a weak solution of caustic soda for a week or ten days, after which they are carefully washed and purified. The next operation is to squeeze them as dry as possible, and transfer them to the gelatinizing pots, which are large earthen vessels, inclosed in wooden cases, made steamtight. Water is poured in with the pieces, and kept at a high temperature by means of the steam in the cases surrounding the pots. By this means the gelatin is quite dissolved out of the skin, and is strained off while hot. Gelatin, however, is more generally prepared from bones. These are treated with dilute hydrochloric acid, which dissolves the mineral constituents of the bone, consisting of phosphates and carbonates of calcium, magnesium, etc., and leaves the bone cartilage. This, when boiled for a long time with water, dissolves, and forms gelatin, which can be purified by dissolving in hot water and precipitating by alcohol. Pure

gelatin is amorphous, transparent in thin plates, of a yellowish white color; it has neither taste nor smell, and is neutral to vegetable colors; it is insoluble in alcohol and in ether. In contact with cold water it swells up, and is soluble in hot water. It is not precipitated by acids, except by tannic acid, which gives a flaky precipitate insoluble in water, alcohol, and ether. Gelatin contains about 50 per cent. of carbon, 6.6 of hydrogen, and 18.4 of nitrogen. Moist gelatine exposed to the air rapidly putrefies, the liquid becoming first acid, but afterward it gives off ammonia. The nutritious value of gelatin has been much overestimated. Isinglass is prepared from the form derived from the sturgeon's bladder; and gelatine is also made use of in photography.

Vegetable Jelly, analogous to animal gelatine, is obtained largely from some fruits, but never in pure state; it is of value only in preserving such parts of the fruit for culinary purposes; but several of the sea-weeds yield a large quantity of very pure jelly, which, in some instances, is applied to important purposes: thus, the jelly of *Fucus spinosus*, the agar-agar, or agal-agal, abundant on the shore of the eastern seas, is used by the E. Indians, Cingalese, and Chinese for dressing their silks; the Chinese also ingeniously form thin films of the jelly over a framework of bamboo, and thus make small windows for their houses. This, and another, *Gracillaria lichenöides*, are formed into a thick jelly, with sugar and other materials, and eaten as a delicacy; and both are supposed to supply the material for those wonderful birds'-nests, which constitute the most costly luxury known to the art of cooking. Another jelly-yielding sea weed is found on American and British shores, called Irish moss or carrageen (q.v.); which is often made into jellies for invalids, and the plant itself is extensively used in feeding cattle, especially in England.

GEL'BITE: see Explosives.

GELD, v. *gĕld* [Icel. *gelda;* Ger. *geilen;* Dan. *gilde*, to castrate]: to deprive of generative power; to castrate; to deprive of any essential part. Geld'ing, imp.: N. act of depriving of generative power; a castrated animal, chiefly a horse. Geld'ed, pp. castrated.

GELDERLAND, *ċhĕl'dėr-lânt:* province of the Netherlands, between the Zuider Zee on the n.w., and the Prussian dominions on the s.e.; 1,948 sq. m. It is watered chiefly by the Yssel, and Rhine, and the Waal. The surface is undulating, and northward from Arnheim, the capital, are beautiful well wooded districts; in the n.w., sandy ground, heath, and extensive tracts of oak trees, grown for bark and fire-wood. The climate is healthful, and the soil, on the whole, good, though much of it is still uncultivated sand and marsh. Along the river valleys a rich loamy soil is found. Agriculture is prosecuted with great success. Wheat, rye, buckwheat, tobacco, fruit, etc., are extensively grown. Among the manufactures paper

and leather are the principal. Chief towns—Arnheim, Nimeguen, and Zutphen. Pop. about 600,000.

GELÉE, CLAUDE: see CLAUDE LORRAINE.

GELERT, JOHANNES SOPHUS, American sculptor: b. Schleswig, Denmark, 1852, Dec. 10. He studied in the Royal Academy of Fine Arts at Copenhagen in 1870–5, removed to the United States in 1887, received a gold medal and honorable mention at the World's Columbian Exposition (1893), a gold medal at the Nashville Centennial Exposition (1897), and honorable mention and a gold medal at the Paris Exposition of 1900. His works include the monument to the policemen killed by the Chicago anarchists, Haymarket Square, Chicago; statues of Beethoven and Andersen in Lincoln Park, Chicago; a statue of Grant at Galena, Ill.

GELID, a. *jĕl'ĭd* [L. *gelĭdŭs*, cold as ice—from *gĕlū*, ice, frost: It. *gelido*]: very cold. GEL'IDLY, ad. *-lĭ*. GEL'IDNESS, n., or GELIDITY, n. *jĕ-lĭd'ĭ-tĭ*, great coldness.

GELIDIUM, *jĕl-ĭd'ĭ-ŭm*: genus of *Algæ* (sea-weeds), of sub-ord. *Ceramiaceæ*, some of the species of which are believed to afford the material used by certain species of swallow in building the edible nests so much prized by the Chinese: see NESTS, EDIBLE. Several species of gelidium are used as food in the east. Like many other sea-weeds of this order, they are almost entirely gelatinous, and when boiled with condiments to give pungency and flavor, form a very wholesome and agreeable food.

GELL, *jĕl*, Sir WILLIAM, Knight: antiquarian and classical scholar: 1777–1836, Feb. 4; younger son of Philip Gell of Hopton, Derbyshire. He was educated at Jesus College, Cambridge, where he graduated B.A. 1798, and M.A. 1804, and was sometime a fellow of Emmanuel College in that university. He gave his time principally to antiquarian research and geographical studies, and published the following: *The Topography of Troy* (1804, folio); *The Geography and Antiquities of Ithaca* (1808, 4to); *The Itinerary of Greece* (1810, 4to); *The Itinerary of the Morea* (1817, 8vo); *Attica* (1817, folio); *Pompeiiana, or Observations upon the Topography, Edifices, and Ornaments of Pompeii*—in conjunction with I. P. Gandy, an interesting and beautiful work, which first brought his name into notice (2 vols. 8vo 1817–19; second series, 2 vols. 8vo, 1832); *Narrative of a Journey in the Morea* (1823, 8vo); *The Topography of Rome and its Vicinity* (1834, 8vo); *Rome and its Environs* (Map 1834). In his later years he resided in Italy, principally at Naples, having a house also at Rome.

GELLERT, *gĕl'ĕrt*, CHRISTIAN FURCHTEGOTT: 1715, July 4—1769, Dec. 13; b. Haynichen, in the Erzgebirge, in Saxony: poet and moralist. He entered the Univ. of Leipsic 1734, where he applied himself mainly to theology. After some years as tutor, and teacher in a public academy, he obtained a professorship in the Univ. of Leipsic

1751. His lectures on poetry, rhetoric, and morals were numerously attended, and were greatly admired. Gellert was a man of spotless virtue, but rather feminine in mind and character. He wrote fables, stories, didactic poems, spiritual odes and songs. His most popular writings were his fables and stories, marked by ease and naturalness. His spiritual odes owe their continued popularity to their devout fervor, and to a certain vigor and loftiness of flight not found in his other poems. Gellert was one of the pioneers of modern German literature. He marks with others, the transition from the dulness and pedantry of the previous generation of authors, to that rich and superabundant life which Goethe and Schiller poured into the national literature. Gellert's collective works (*Sämmtliche Werke*) appeared first at Leipsic, 10 vols. (1769–74), and have passed through various editions; the most recent, Berlin (10 vols. 1867). Compare *Gellert's Leben*, by J. A. Cramer (Leip. 1774), by Döring (1833), and by Ritter (1870); also *Gellert's Tagebuch* (2d ed., Leip. 1863).

GELLIUS, *jĕl'lĭ-ŭs*, AULUS: Latin author, who seems to have lived about A.D. 117–180: the exact date, of either his birth or his death, is not known. He is supposed to have been born at Rome, where it is known that he studied rhetoric. Subsequently, he went to Athens to undergo a discipline in philosophy. On his return to Rome, he entered upon a legal career, but not abandoning his literary pursuits. Gellius's well-known work, the Attic Nights (*Noctes Atticæ*), begun during the long nights of winter in a country-house near Athens, and completed during the latter years of his life, is a collection of miscellaneous matter on language, antiquities, history, and literature, in 20 books of which the 8th is wanting. It contains many extracts from Greek and Latin works no longer extant. The work is destitute of any plan or arrangement, is disfigured by archaisms, and derives its value mainly from being a repertory of curious knowledge. The *Editio Princeps* appeared at Rome 1469; the earliest critical edition is that of Gronovius (Lug. Bat. 1706); the most important edition is that of Hertz (2 vols., Leip. 1853). Gellius has been translated into English by Beloe (Lond. 1795); into French by the Abbé de Verteuil (Paris, 1776); and (in part) into German by Von Walterstern (1785), also by Weiss (Leip. 1875–6).

GELON, *jē'lon:* 'tyrant' of Gela and Syracuse: b. Gela; son of Deinomenes; d. B.C. 478 (ruled B.C. 491–478). His family was one of the oldest and most distinguished in the place. Gelon himself figures in history first as one of the body-guards in the service of Hippocrates, tyrant of Gela. On the death of the latter, he contrived to obtain the supreme power, and about B.C. 485 he made himself master of Syracuse also, which then became the seat of his government, and to which he transferred the majority of the inhabitants of Gela. His influence soon extended itself over the half of Sicily. Gelon refused to aid the

Greeks against Xerxes, as they declined to comply with his demand that he should be appointed commander-in-chief. About the same time, Terillus, ruler of Himera, in Sicily, invoked the aid of the Carthaginians against Theron of Agrigentum, who had dispossessed him of his state. Gelon who was in alliance with Theron, hastened to the assistance of the latter, and on the same day (according to tradition) on which the Greeks won the battle of Salamis, he gained a complete victory over the invaders at Himera. The consequence was an immediate treaty of peace between him and the Carthaginians, who were compelled to pay all the expenses of the war. His clemency and the wisdom of his measures rendered him so generally beloved, that when he appeared unarmed in an assembly of the people, and declared himself ready to resign his power, he was unanimously hailed as the deliverer and sovereign of Syracuse. The story current in later times, that one of the conditions on which he granted peace to the Carthaginians was, that their human sacrifices should be abolished, has probably no historical foundation, but illustrates the general belief in the humanity of his character. The people, who, contrary to his desire, had erected a splendid monument to his memory, paid him honors as a hero, and at a later period, when all the brazen statues were sold under Timoleon, his statue was made an exception to the general rule. He was succeeded by his brother Hiero.

GELÓNES, *jĕ-lō′nēz*, or GELONI, *jē-lō′nī:* people of Scythia, descended from Gelonus, a son of Hercules, and occupying a region e. of the Borysthenes river. They were inured from their youth to labor and fatigue, and painted themselves to appear more terrible in battle.

GELOSCOPY, n. *jĕ-lŏs′ko-pĭ* [Gr. *gelōs*, laughter; *skopeō*, I see]: an old kind of divination by the laughter of any person; the inferring or discovering the qualities, etc., of any person by the nature of his laughter.

GELSEMIUM SEMPERVIRENS: the Carolina or yellow jasmine, a clinging vine indigenous to the southern Atlantic sea coast of the United States, characterized by abundance of yellow and strongly perfumed flowers. It belongs to the family of Loganiaceæ and must not be confounded with the true Jasmine (q.v.) or with the Cape Jessamine. The stem is twining, smooth, and shining; the leaves are perennial, dark green above and lighter below, petiolate, lanceolate. The flowers about an inch across, grow in clusters; the calyx is five-leaved and the corolla is funnel-shaped and five-lobed. The fruit is a flat compressed capsule, two celled, and contains a number of flat seeds. The flowers are reputed poisonous. The rhizomes or creeping stems are collected for use in medicine. They contain an alkaloid, gelsemine, and an acid, gelseminic acid, both characteristic of the plant. Its aqueous or alcoholic extract may be used. In excess it produces narcotic and toxic effects, inducing muscular weakness and chilly sen-

sations, and interfering with the circulation of the blood, probably by the disturbance of the heart's action. It is used as an antiperiodic and in spasmodic and neuralgic affections. A planter of Mississippi discovered its power accidentally, administering it to himself by mistake for the root of another plant. The dose of the tincture is 10 minims, of the fluid-extract 2 minims, to be repeated every 2, 4, or 6 hours until the desired or some definite effect is produced. The fatal dose is not well fixed; in one case 40 drops of the fluid-extract proved fatal, but less would probably have had the same effect. It has found a place in the U. S. Pharmacopœia under the title *Gelsemium*.

GELT, n. *gĕlt* [Gael. *geillte*, a coward—from *geill*, to yield]: in *OE.*, a cowardly, guilty person; a coward.

GEM, n. *jĕm* [AS. *gym*, a gem; Icel. *gim*, shining—from *gima*, to shine]: a precious stone of any kind; in *bot.* a bud (see GEMMA); anything exceedingly beautiful or, attractive: V. to adorn with precious stones, to embellish; to bespangle; to put forth the first buds. GEM'MING, imp. GEMMED, pp. *jĕmd*. GEMMY, a. *jĕm'mĭ*, resembling or adorned with gems; glittering. *Note.*—The origin of GEM is obscured by the loss of an *l*, thus Icel. *gimlir*, splendor—from *gima* for *glima*, to shine: L. *gemma*, in sense of a gem, is an acquired sense.

GEM: usually a precious stone of small size, such as may be used for setting in a ring, or for similar purpose of ornament: sometimes in mineralogy, in an arbitrary sense for scientific classification, used to denote an *order* or *family* of minerals, generally hard enough to scratch quartz, insoluble in acids, infusible before the blow-pipe, without metallic lustre, but mostly brilliant and beautiful. Among them are included some of the minerals, which, in popular language, are most generally known as gems—ruby, sapphire, spinel, topaz, beryl, emerald, tourmaline, hyacinth, zircon, etc.—and some rarer minerals of similar character but with these are ranked minerals, often coarser varieties of the same species, which are not *gems* in the popular sense of the word, e.g. emery and common corundum, while diamond and some other precious stones, much used as gems, are excluded. The most important gems, in the ordinary sense of the word, are: (1) the diamond (q.v.), a crystallized form of pure carbon, often called the 'king of gems,' although not the rarest or most valuable; (2) the ruby and the sapphire, both transparent varieties of corundum (q.v.), the first a carmine red, the second a bright blue; rubies are extremely rare, and when large, are worth from five to ten times the price of diamonds the same size; (3) the emerald, and beryl, both a silicate of alumina and glucina, the former a rich green, the latter varying in color from blue through light green to yellow; (4) chrysoberyl, a compound of alumina and glucina, rare; (5) the topaz, a complicated silicate of alumina, generally yellow, though showing other colors, also; (6) tourmaline, also a silicate of alumina, usually black, but also of trans-

parent green, red, and other colors, frequently mingled in the same crystal; (7) garnet, another group of alumina-silicates, combined with various metallic oxides; the usual color is red; green and other colors also occur.

The term *gem*, in archeology, is applied to engraved stones of the precious kinds and even small engraved portions of hard and primitive rocks which have been set and worn as jewels by the ancients. Although the principal varieties of precious stones were known to the ancients, yet owing to the absence of scientific and chemical analysis, they appear to have distinguished precious, and other stones, only by color, specific gravity and density. The different nomenclature, too, used by different authors, multiplied synonyms and caused confusion; so that it has become impossible to identify all the stones mentioned by ancient writers. As a general rule, the ancients did not engrave such precious stones as the diamond, ruby, and sapphire, being content with those of less hardness and value. In the selection of stones the engravers frequently adapted the material to the subject—Bacchanalian subjects were often engraved on amethysts; marine, on beryls; martial, on carnelians, sards, and red jaspers; rural, on green jasper; celestial, on chalcedonies.

The art of engraving precious stones at the earlier periods of the Egyptian monarchy was comparatively unknown; under the Ptolemies and Romans, the Gnostic gems, called Abraxas, generally of lapis lazuli, blood-stone, and jasper, begin to appear, but these are made by the same process as the Greek, from which they were derived. The Ethiopians, according to Herodotus, engraved signets. The same may be said of the neighboring Phœnicia, which either imitated the cylinders of the Babylonians, or the scarabæi of the Etruscans. In Assyria, the oldest gems are of cylindrical shape, from one to two inches long, and half an inch thick, pierced through their long axis for a cord to attach round the wrist. The earlier ones are of serpentine, the later of the time of Sargon or Shalmaneser, of agate, jasper, quartz, and syenite, engraved with figures of the gods, and the names of their possessors in cuneiform.

The Babylonian are of the same type, and chiefly of hæmatite, loadstone, steatite, and jasper; have also figures of deities, and the names of deities or the possessors, generally executed in a coarse rude style by the graver. Oval gems, indeed, appear, from the impressions on the clay tablets, to have been in use at the same time; that of cylinders passed to the Persians, under whom the art became much better, and chance has preserved the cylinder signet of Darius I., found in Egypt. These cylinders were abandoned for conical gems, principally of chalcedony, engraved on the base with figures of deities, in use prior to the conquest of Alexander, and were at a later period, commencing in the 3d c. after Christ, followed by hemispherical agate gems, with heads, animals, and Pehlevi inscriptions, generally of a rude and debased style of

art. These at a later period, were succeeded by convex stones *en cabochon*, often garnets, sards, carbuncles, engraved on the upper surface, with rude figures of animals, heads, and other devices accompanied with Pehlevi inscriptions; and these probably continued till the rise of Mohammedanism in the East, when the art was confined to the engraving of cufic legends on the most valuable of oriental stones, often with great dexterity.

Among the Greeks, the earliest instance of an engraved gem is the emerald ring of Polycrates, engraved by Theodorus of Samos about B.C. 740, while the laws of Solon against counterfeiting signets show that they may have been in early use. At the period of the Persian war they were common. Later, the writings of the Platonists and Stoics constantly allude to gems. Yet it is doubtful if any real Greek intagli earlier than the war of Peloponnesus can be identified, those hitherto cited in low relief, inclosed in a guilloche or engrailed border, and of a hard and stiff style of art, having been probably cut from the bases of scarabæi of Etruscan work. At a later period their use was universal, and the names of celebrated engravers such as Pyrgoteles and Apollonides are known. Pyrgoteles was distinguished for works in relief, and from his time the art may have risen gradually to that later degree of perfection of which we possess such rich specimens. The style of this age is fine and noble; the subjects are generally heroic, but busts and portraits of historical personages appear; some are copies of the master-pieces of sculpture. Sards, amethysts, and jacinths were in use.

The Etruscan school is probably earlier than the Greek. Their work consists of scarabs carved out of sard, carnelian or agate, sometimes of exquisite workmanship, but generally harsh. The subjects are derived from the earliest Hellenic myths; and there are occasional inscriptions in the Etruscan language. These gems probably were made from the beginning to the middle of B.C. 3d. c., when Etruria fell into the power of the Romans, who derived their engraved stones from the Greeks, as engraved rings, with their subjects, are mentioned at the close of the republic, the device of Scipio Africanus being a head of Scyphax; that of Sylla, the submission of Jugurtha; of Pompey, a lion carrying a sword; and of Cæsar, Venus armed with a dart. At the beginning of the Empire, the portrait gems follow the costume and art of the period; among the artists of this age are Dioscorides, Apollonides, and Chronios. The names of the artists who engraved the gems, and of the owners, are occasionally found on them; the devices are various. After the Antonines the art rapidly declined, and portraits after Severus are rare, though even that of Mauricius is said to occur. At the middle period of the Empire, the work is exceedingly rude. often merely scratched out by a diamond point in carnelians jaspers, and garnets. Some works, indeed, of the later or Byzantine period exist, but they are of little merit and poor execution, and the subjects are taken from

Christian subjects. The gems of this later period are sometimes square, generally, however, the long or convex oval. The *camei*, or gems in relief, the ancient *ectypa sculptura*, appear at the period of the Roman Empire. This term *camei*, of uncertain origin, is applied to engravings on stones of two or more layers, such as the onyx or sardonyx, and niccolo, and is different from the relief-gems cut out of stones of one color. These ancient camei are of the greatest rarity.

Many of the inscriptions on ancient gems have been added by subsequent owners, and are not of the age of the gem itself. The names of the artists are also frequently forgeries; and since the revival of the art, modern artists have so successfully imitated both ancient gems and the signatures that the detection of real antiques requires great learning and much experience. The chief implements of the ancient engravers were the lathe, the diamond point, and by some it is thought, diamond-powder; but it is a question if the diamond was known before the 6th century A.D. The general fall of the arts at the period of the Byzantine Empire, seems to have been accompanied by the decline of the art of engraving on gems; and the Merovingian and Carlovingian monarchs were compelled to use antique gems, instead of those engraved by the artists of their day.

In the middle ages these ancient gems were preserved in shrines, chasses, and other ecclesiastical vessels, in which they were set. The art of gem engraving was nearly lost till the beginning of the 15th c. The first to revive it was Vittore Pisanello, who lived in Florence about the year 1406. The first among the Germans was Daniel Engelhard, of Nuremberg, who died in 1512. The discovery of some fine specimens in Italy, particularly in Florence, and the display of gems by the Emperor Palæologus, at the Council of Florence in 1438, were perhaps the original cause of the taste of the Medici for engraved stones. The popes and that family were the first patrons of this art in modern times. A Florentine artist, generally called on account of his great skill, Giovanni delle Carniole ('of the Carnelians'), distinguished himself in this early modern period. There are few gems, however, which can be ascribed to him with any confidence. Contemporaries and rivals of Giovanni were Nanni di Prospero delle Carniole, in Florence and Domenico Compagnie (*dei camei*), a Milanese, whose portrait of Ludovico Sforza, called Moro, cut in a ruby, is still preserved. After Bernardi (delle Carniole), Valerio Vicentino (under Leo X.) rendered himself famous as a gem-engraver. This art found patrons in all the Italian princes; the number of artists constantly increased, and the sphere of their work was extended. The names of these artists, however, are not generally known, because they are rarely put on the stones.

In England the art was revived at a somewhat later date by Natter, Pichler, and Marchant. The most eminent artist of more modern times is perhaps, Berini, a native

of Rome, who, with Cervera, and Giromelli at Rome, and Putinati, at Milan, produced very fine works. In our own times the demand for cameos and intaglios in the United States was greatest from 1870 to 1880. During that time more than 100 workmen found employment here,—many of them as portrait artists. Among these were Lebrethon, Zöllner, who engraved some fine and important cameos, and L. Bonet. In 1903 there appeared a slight revival of the wearing of antique and old-fashioned cameos of rather a pronounced form, and it is quite possible that the glyptic art is again on the way to favor.

Among gem collections may be mentioned the Florentine collection, the Vienna collection, the British Museum collection; and in the U. S., the Cesnola and other collections, at the New York Metropolitan Museum of Arts, the collection at the Boston Museum of Fine Arts, the Maxwell Somerville collection, the types of his works, at the University of Pennsylvania, and the Walters collection, at Baltimore, Md.

GEMARA, n. *gĕ-măr′ă* [Heb. *gemara,* tradition—from Chald. *gamar,* to finish or complete]: that portion of the two Talmuds which contains the annotations, discussions, and amplifications of the Mishna by the academies of Palestine on the one hand, and those of Babylon on the other. The Babylonian Gemára, more complete as well as more lucid than the Palestinensian, possesses a much more highly valued authority. The final redaction of this latter falls in the middle of the 4th c., while the Babylonian was not completed till A.D. 500. See MISHNAH and TALMUD. GEMARIC, a. *gĕ-măr′ĭk,* pertaining to.

GEMELLARIA, n. *jĕm-ĕl-lär′ĭ-a* [L. *gemellaria, gemellar,* a vessel for holding oil]: typical genus of *Gemellaridæ,* family of infundibulate polyzoa, sub-order *Cheilostomata;* founded by Prof. Burk.

GEMINATE: see under GEMINI.

GEMINI, n. plu. *jĕm′ĭ-nī* [L. *gemĭnī,* twins; *gemĭnātus,* doubled]: twins: one of the signs of the zodiac, being the third constellation in the zodiac; so named from its two brightest stars, Castor of the first magnitude, and Pollux of the second. GEM′INOUS, a. *-ĭ-nŭs,* double; in pairs. GEM′INATE, a. *-ĭ-nāt,* in *bot.,* growing in pairs. GEMINY, n. *jĕm′ĭ-nĭ,* in *OE.,* a pair; a brace.

GEMISTUS, *jē-mĭs′tŭs,* GIORGIOS, called GIORGIOS PLETHON, and commonly GEMISTUS PLETHON: last of the Byzantine writers. The exact dates of his birth and death are uncertain, but he is known to have lived between 1350 and 1450. He was born probably at Constantinople, but the greater part of his life was passed in the Peloponnesus. He was one of the deputies sent by the Greek church to the council at Florence 1438, for the purpose of arranging a union between the Latin and Greek churches. The council entirely failed in its purpose. Gemistus was celebrated as philosopher more than theologian. In his time the Aristotelian philosophy was supreme, but it had degenerated into a mere science of words, from the study of which Gemistus

turned away disgusted, and applied himself to Plato. Plato's philosophy so charmed him, that thenceforward he labored for its propagation; and in furtherance of this view, Gemistus, when in Italy, induced Cosmo de Medici to embrace it. Cosmo's example was followed by others in Florence, and thus a Platonic school was founded in the west which flourished for nearly 100 years. During the latter part of his life Gemistus was engaged in bitter conflict with the most eminent of the Aristotelians, among whom George of Trebizond held a high position, and the debate between the two was carried on with most unseemly violence. Gemistus is heard of in history last in 1441, in the Peloponnesus in an official capacity. Gemistus wrote a great number of works in history, philosophy, theology, etc.

GEMITORES, n. *jĕm-ĭ-tōr′ēz* [L. *gemitus*, a sigh—from *gemo*, I sigh, I groan; name not appropriate, as *gemo* does not mean to coo, and the cheerful song of the pigeons is neither a sigh nor a groan]: cooers; the same as the suborder *Columbacei*. It includes the pigeons.

GEMMA, n. *jĕm′mă* [F. *gemme*—from L. *gemma*, a bud]: a bud. GEMMA′CEOUS, a. *-mā′shŭs*, pertaining to leaf-buds or to gems. GEM′MÆ, n. *-mē*, leaf-buds; bulbils or adventitious shoots. GEM′MATE, a. *-māt*, in *bot.*, having buds. GEM′MATED, a. having buds; adorned with gems. GEMMA′TION, n. *-mā′shŭn*, the disposition of the buds on plants; the period of the expansion of buds on plants; in *zool.*, the reproduction of numerous species of the lower types of animals in which the process is akin to the budding of plants (see REPRODUCTION). GEMMED, pp. *jĕmd*, adorned with buds or gems. GEM′MEOUS, a. *-mē-ŭs*, connected with or having the nature of a gem. GEMMIF′EROUS a. *-mĭf′ĕr-ŭs* [L. *fĕrō*, I bear]: bearing buds. GEMMIP′AROUS, a. *-mĭp′ă-rŭs* [L. *părĭō*, I produce]: reproducing by buffs; multiplying by a process of budding (see REPRODUCTION). GEMMULE, n. *jĕm′mūl*, the first bud of the embryo; a little bud or gem.

GEMONA, *jā-mō′nâ:* town of Venetia, 15 m. n. by w. from Udine, on a feeder of the Tagliamento. It lies in a deep basin among mountains, is well-built and surrounded by walls. Gemona has a large transit-trade, and two important annual fairs. Pop. 3,000.

GEMOTE, n. *gĕ-mōt′* [see MOTE 2]: a meeting; an assembly usually in some sort official. Besides the great council of the nation—the *Witena-gemot*, usually spelled Witenagemót (q.v.) which corresponded to the Reichstage of the Franks, and which, though it took the place of the still more ancient meetings of the whole nation, to which Tacitus refers as characteristic institutions of the Teutonic tribes in his day, was a representative, though not perhaps an elective body (Kemble's *Saxons in England*, II. 194)—there were among the Anglo-Saxons various minor motes or moots, not representative. The existence of these is an instance of the manner in which the spirit of localization

has always maintained its ground, and balanced that of centralization among the Germanic nations, particularly in England. There was the *shire-gemot,* or county court, which met twice a year; and the *burg-gemot,* thrice; the *hundred-gemot* (see HUNDRED), every month, and an extraordinary meeting of which was held twice a year; the halle-gemot, or *court-buron.* These institutions excluded not only central despotism, but local tyranny in the shape of individual caprice. The ealdorman decided only with the assent of the shire-gemote, just as the king was dependent upon that of the Witan.

GEMS, ARTIFICIAL PRODUCTION OF. Ever since the chemical composition of our most valued gems—diamond, ruby, opal, etc.—has been known, attempts have been made, with more or less success, to reconstruct them in the laboratory by the influence of intense heat, electrical action, etc. Of these processes may be mentioned that introduced by the French chemists Frémy and Verneuil. They succeeded in manufacturing excellent rubies, very like the natural ones in shape and composition, by raising carefully to a red heat a mixture of alumina, barium fluoride, and a very small quantity of bichromate of potash. The rubies are found in a friable matrix. If a little cobalt oxide be present in the mixture, sapphires are obtained instead of rubies. Many experiments with a view to producing diamonds artificially have been made within recent years. From hydrocarbons, subjected to a very intense heat, and enormous pressure, minute crystals have been obtained which are as hard as the natural diamond, scratching all other minerals, and not affecting polarized light. The process is, however, expensive, tedious, and dangerous, and the diamonds produced are as yet so small that it requires more than 1,000 of them to make a carat; only ½ carat has been produced, at an expense of $2,000; hence they represent nothing beyond a scientific value.

GEMS, IMITATION, or PASTES (*Pierres Précieuses Artificielles*): imitations of the precious stones, made of glass specially prepared. It differs from ordinary glass in having 50 per cent. of oxide of lead among its constituents. When obtained very pure it is melted and mixed with substances having a metallic base, generally oxides, which communicate to the mass the various desired colors, on the careful admixture of these colors, and on the skilful cutting to represent the forms into which real gems are usually cut, the success of the manufacture chiefly depends. By some persons, the cutting is carried to such a marvellous perfection, that their work would deceive the eye of most ordinary judges, when well set and *foiled,* or backed with silver or tinfoil: see FOIL.

The glass used for artificial gems is generally called *strass,* from the name of a German who claimed the invention. But if we seek the real inventor of factitious gems we must go far behind the time of Strass, for we find Pliny describing, under the name of *gemmæ vitreæ,* certain imi-

tations of precious stones known in his time, some of which were certainly of colored glass, and others made by ingeniously cementing together layers of variously colored transparent stones. Other allusions are plentifully scattered through the works of classical authors; and ancient artificial gems themselves exist, two especially famous being imitations of a chrysolite and an emerald, among the Roman antiquities in the Museum Victorium at Rome.

A few details are given, showing how some of the principal gems may be imitated. The diamond being colorless pure strass simply cut into brilliants and roses is used as a counterfeit. The ruby is imitated by mixing 1,000 parts of strass, 40 parts of glass of antimony, 1 part purple of Cassius (a preparation of gold and binoxide of tin), and 1 part in excess of gold. Sapphires are counterfeited by 1,000 parts strass, and 25 of oxide of cobalt. Topaz—the same formula as for ruby, without the excess of gold, and heated for a less time. Emerald, 1,000 parts of strass, 8 oxide of copper, and 0.2 oxide of chromium. Amethyst, 1,000 parts strass, 25 oxide of cobalt, and a little oxide of manganese. Garnet, 1,000 parts strass, and a variable quantity of purple of Cassius according to the shade to be obtained. In all these preparations a thorough pulverization and mixture of the ingredients are of importance; the fusion should be long continued at a graduated and uniform maximum temperature, and the mixture be annealed in cooling. These imitations, which are made in immense quantities in large factories in France and elsewhere, are chiefly used in the manufacture of cheap jewelry.

GEMS-BOK, *jĕmz'bŏk* or *gĕmz'bŏk* (*Antilope Oryx*, or *Oryx Gazella*): species of antelope, described by some naturalists as the Oryx, but which, being a native of s. Africa only, cannot be the Oryx (q.v.) of the ancients, though it is certainly a nearly allied species. It is a heavy, stout animal, about the size of a stag, with rough reversed hair on the neck and along the ridge of the back; large pointed ears; and almost perfectly straight horns, fully two ft. long, in the plane of the forehead, little diverging, and obscurely ringed at the base. The colors are harshly contrasted, dark rusty gray above, and white on the under parts, separated by a broad dark brown or black band; the head white, with black transverse bands; the thighs black, and the legs white. The hoofs are remarkably long, adapted to the rocky, mountainous districts which the animal frequents. The Gems-Bok makes such use of its horns as sometimes even to beat off the lion. It inhabits districts free from wood, and is generally found in pairs or in very small herds.

GEMSHORN, *gĕmz'hawrn:* well-known organ-stop in German organs, the pipes of which are of tin, and conically shaped, being much narrower at the open end; while at the mouth, at the broad end, there are ears on each to regulate the tuning. It has a peculiarly pleasant tone, of a different character from either an open cylinder pipe or a stopped pipe. The pitch of the gemshorn is generally 8 ft. tone, sometimes it is 4 ft. and in the pedal organ 16 feet.

GEMS, Mythology of: the ancients believed that each month of the year was under the influence of a precious stone, and it is still the custom to wear birth-month stones in preference to other jewels. The following list has been current for many years:

January	Garnet	Constancy
February	Amethyst	Sincerity
March	Bloodstone	Courage
April	Diamond	Innocence
May	Emerald	Success in love
June	Agate	Health and long life
July	Cornelian	Content
August	Sardonyx	Conjugal felicity
September	Chrysolite	Antidote to madness
October	Opal	Hope
November	Topaz	Fidelity
December	Turquoise	Prosperity

The seven gems which are supposed to be under the influence of the seven chief planets are these:

Saturn	Onyx
Jupiter	Cornelian
Mars	Diamond
Sun	Sapphire
Venus	Emerald
Mercury	Loadstone or Lodestone
Moon	Crystal

The legend of the diamond tells how Diamond was the name of a beautiful youth of the island of Crete, who was one of the attendants of the infant Jupiter in his cradle. Diamond, not to be subject to 'the ills that flesh is heir to,' was transformed into the hardest and most brilliant substance in nature. The diamond among the ancients had the virtue of bestowing victory and fortitude. It calmed anger and strengthened wedded love; hence it was called the stone of reconciliation. The diamond, too, among the Greeks was a symbol of severe and inexorable justice and of the impassibility of fate. Hence the judges of Hades were described as having hearts of adamant.

GEMÜNDER, *ghĕh-mün'dėr*, George: violin-maker: b. Ingelfingen, Würtemburg, Germany, 1816, Apr. 13. He learned his trade with his father and Baptiste Vuillaume, in Paris, came to the United States and settled in Boston 1847, and made his permanent residence in New York 1852. His violins, made out of natural woods treated with a varnish of his own make, and frequently mistaken for the productions of the old Italian masters, have taken prize medals at the World's Fair, London (1851), Paris Exhibition (1867), New York (1870), Vienna (1873), Philadelphia (1876), Amsterdam (1883), London (1884), New Orleans (1884–5), and London (1886). He d. 1895, Sep. 7.

GEN, n. *jĕn* [Pers.]: a name for Persian manna, called also *Alhāgi manna*, obtained from the camel's-thorn, a plant indigenous in the East.

GENAPPE, n. *jĕ-năp'* [from the place of its manufacture]: a worsted yarn, whose smoothness enables it to be conveniently combined with silk, and so well adapted for braids, fringes, etc.

GENDARMES, n. *zhâng' dârm* [F. man-at-arms]: in

France, a sort of military police: originally, and to the time of the first French revolution, the most distinguished cavalry corps in the service of the Bourbon kings, to whom they formed a sort of body-guard. Under existing arrangements, the gendarmes constitute a military police, and comprise both cavalry and infantry. The force consists principally of soldiers taken from the army, generally on account of intelligence and good conduct. The men receive much higher pay than the rest of the army, of which, however, the corps is a part, and they are liable in cases of emergency to be sent on active service. The gendarmes amount to about 27,000 men, and are intrusted with the execution of many of the most delicate details of government.

GENDER, v. *jĕn'dėr* [F. *engendrer*, to *engender*]: for *engender;* to produce.

GENDER, n. *jĕn'dėr* [F. *genre*—from L. *genĕrĕ*, with a kind—from *genus*, kind or sort: It. *genere*]: sex: in *gram.*, the difference in words expressing the distinctions between male, and female, and things destitute of life, the genders thus being accounted three.

In grammar, names applied to the male sex are said to be of the *masculine* gender, as *man, poet;* those applied to the female sex, *feminine*, as *woman, poetess;* words neither masculine nor feminine are, as it was expressed in Latin, *neutrius generis*, 'of neither gender,' and from this phrase grammarians have come to speak, somewhat incorrectly, of this class of words as being 'of the neuter gender,' and hence to reckon three genders. In English, the distinction of gender in nouns is chiefly marked in the pronouns substituted for them—*he, she, it;* and the lower types of life are generally comprised in the neuter gender: a *noun* or *name* is said to be of 'common gender' when it can be applied to a male or female indifferently. Gender, strictly speaking, is applicable only to living beings distinguishable as male and female; but by the figure of speech called personification (q.v.), inanimate objects are often spoken of as *he* and *she*. In the infancy of language, however, when every word was what we should now call a metaphor—when every thing that moved or was seen to produce any effect, was conceived as actuated by a conscious will, like that which the spectator felt within himself—every prominent or interesting object in the universe would be invested with one or the other sex, according to the analogy it suggested. In Latin, accordingly, *gladius*, a sword, was considered masculine; *navis*, a ship, as feminine; and *pomum*, a fruit or apple, was thought of as without sex. Similarly, in Sanskrit and Greek, the greater part of inanimate objects are either masculine or feminine, the others being neuter. In Hebrew, everything is either masculine or feminine, there being no neuter; and this is the case in the modern languages derived from the Latin viz., Italian, French, Spanish, and Portuguese—everything is either a *he* or a *she*. German resembles the classic languages in making some

inanimate objects masculine, some feminine, and others neuter. Thus at table, a man must speak of the spoon (*der löffel*) as 'he,' of the fork (*die gabel*) as 'she,' and of the knife (*das messer*) as 'it.' English—in this more rational than any of its congeners—has banished the spurious distinctions of gender that encumbered the Anglo-Saxon like the other Teutonic tongues, and attributes sex only to living beings, except in certain metaphorical terms, as, 'The Germanic and Britannic are sister ships.'

In the highly inflected languages, there are certain terminations distinctive of the different genders. It is probable indeed, that originally every noun, substantive or adjective had a suffix indicative of the sex, real or imaginary, of the object designated, though like other inflexions (q.v.), these suffixes of gender were in process of time mutilated beyond recognition, or in many cases altogether worn off. The terminations most characteristic of the three genders in Latin are masc. *us;* fem. *a;* neut. *um;* corresponding to the Greek *os, ē, on.* In a great majority of the adjectives in both those languages, the genders are thus marked. In English, the gender of a noun affects only the personal pronoun substituted for it; in most other languages, the adjectives (including the articles) have different forms for the several genders—a useless complication, in the case of modern languages at least. See ADJECTIVE.

Of the terminations distinctive of gender observable in modern English, some are purely Latin, as in *executor, executrix;* the feminine *-ess,* as in *countess,* is borrowed from the French, and is also of classical origin. The prevalent feminine termination in German is *-inn,* as in *tänzerinn,* a female dancer (Fr. *danseuse*): of this there are two instances in English, in the provincial *carlin,* the fem. of *carl,* and *vixen* = Ger. *füchsinn,* a female fox. This affix was already in use in Latin, as in *regina,* a queen (*reg*(*s*), a king); and in this form it is used in Europe generally to feminine proper names; e.g., *Georgina, Wilhelmina, Caroline.*

In such pairs as *son—daughter; man—maid; horse—mare; cock—hen;* there is no etymological relation between the words; they are from distinct roots. But with regard to *hen,* e.g., the Anglo-Saxon had the two forms, *han* for the male, and *hen* for the female; and mare was originally applicable to both sexes, as *horse* still is (Fr. *marechal,* originally an officer who had charge of the horses). The oldest known form of the Teutonic speech, the Gothic, had the two words, *magus,* son, and *magaths,* daughter, both from the root *mag,* to beget, or to make. *Magaths* has become in Ger. *magd,* in Eng. *maid; magus* has been lost in the Teutonic tongues, but it is represented by the Celtic *mac* (son), evidently from the same root. *King, queen,* were in Skr. *ganika,* father, and *goni,* mother, both from the root *gan,* to generate, produce. The masculine form appears in Old Ger. as *chunig,* in modern Ger. *könig,* in Eng. *king;* the feminine became the Greek *gynē,* a woman, as well as the Saxon *cwen,* Sw. *quinna,* Old Eng. *quene* or *quean,* applied to a woman generally, and the modern *queen,* the chief woman of the land.

GENEALOGY, n. *jē′nē-ăl′ŏ-jĭ* [OF. *genealogie*—from Gr. *gĕnĕalŏg′ĭă*, genealogy—from *gĕnŏs*, birth, race; *logos*, discourse]: history of the descent of a person or family from an ancestor; pedigree; lineage. GE′NEALOG′ICAL, a. *-lŏj′ĭ-kăl*, pertaining to the descent of persons or families. GE′NEALOG′ICALLY, ad. *-lĭ*. GE′NEAL′OGIST, n. *-ăl′ŏ-jĭst*, one who traces descents of persons or families. GE′NEAL′OGIZE v. *-jīz*, to investigate the history of descents.

GENEAL′OGY: science of the origin, sequence, and affinities of families, including the descent of persons. Although in itself it is not of sufficient importance to rank as an independent science, yet so far as it has to do with remarkable and eminent families, it forms a very important part of history. It naturally divides itself into two parts, *theoretical* and *practical*. The former embraces the principles on which the science of genealogy is based, while the latter is occupied with tracing the course of particular families themselves. To render perceptible to the senses the descent and relationship of individuals, genealogical tables are made use of, whose arrangement depends on the special purpose for which they are constructed. Usually, however such tables begin with the earliest ancestor (Ger. *stammvater*) of a family, from whom all the known members of both sexes are traced in the order of descent. The importance of this branch of human knowledge, however, is perhaps less obvious in a scientific than in a legal aspect, where it is concerned about the various claims or pretensions of persons based on real or alleged relationship, especially in regard to rights of succession. The earliest traces of genealogy are to be found in the ancestral catalogues of the heroes of the old world. Among the Hebrews, there were officials specially appointed to draw up general genealogical tables. The progress of civilization in states, and in particular the institution of corporations and guilds in the towns, afforded a wider scope of genealogy. But the absence of criticism, and the desire to flatter the great were the causes of introducing—especially after the 14th c.—the most ridiculous fables into genealogy. Ancestors were fabricated in the most impudently false manner, and families carried back in an unbroken line, not only to the age of Charlemagne, but even, in many cases to the heroes in the Trojan war. The fact, however, is, that scarcely any family, however distinguished, can trace its ancestors even to the middle of the 11th c. Among the earlier works on genealogy are Ruxner's *Turnierbuch* (Simmern 1527) and the genealogical tables of Reusner and Hennings, about the end of the 16th c., but these are not conceived in a historical spirit. A more luminous treatment of the subject was initiated in France by Duchesne, St. Marthe, Hozier, Chifflet, Lancelot le Blond, etc.; and in England by Dugdale. Rittershusius of Altdorf (died 1670) and Spencer of Wittenberg (died 1730) were the first in Germany to base genealogy on documentary evidence. The path entered on by them has been prosecuted by König,

Von Imhof, and especially by Hübner in his *Genealogische Tabellen* (4 vols. Leip. 1725–33; new edit., 1737–66), to which Lenz added *Erläuterungen* (Elucidations, Leip. 1756), and Sophia, Queen of Denmark, *Supplement-Tafeln* (Kopenh. 1822–24). Gatterer, in his *Abriss der Genealogie* (Gött. 1788), founded the scientific treatment of the subject, in which he was followed by Putter in his *Tabulæ Genealogicæ*, by Koch in his *Table Généalogiques* (1808), as also by Voigtel (1810), Hopf (1861), Von Behr (1870), Cohn (1871), and Oertel (1871), all in Germany.

In Great Britain, the chief printed collections of genealogical information are the *Peerages*, *Baronages*, *Baronetages*, and *County Histories*. The chief manuscript sources are the public records, heraldic registers, and the parish registers of births, marriages and deaths.

In the United States the chief publications on Genealogy are *The New England Historical and Genealogical Register* Boston; *The New York Genealogical and Biographical Record;* the printed transactions and archives of state and city historical societies; town, city, and state histories, family genealogies, *Appleton's Cyclopædia of American Biography;* and *The Heraldic Journal.* Genealogical research is daily growing in popularity and importance, and more care is now taken than formerly by church and municipal authorities to perfect their records.

GENERA, n. plu. *jĕn′ĕr-ă.* See GENUS.

GENERAL, a. *jĕn′ĕr-ăl* [F. *général*—from L. *gĕnĕrālis*, belonging to a kind or species—from *gĕnŭs*, kind: It. *generale*]: relating to a whole class or order; not special or particular; public; common; extensive; usual: N. the whole; the total; the chief commander of an army; the commander of a division. GEN′ERALLY, ad. *-lĭ*, in the main; without minute detail. GEN′ERAL′ITY, n. *-ăl′ĭ-tĭ*, the main body; the bulk; the greatest part. GENERALSHIP, n. military skill. GENERALIA, n. plu. *jĕn′ĕr-ā′lĭ-ă*, generalities. In GENERAL, in the main; for the most part. LIEUTENANT-GENERAL, an officer second in rank to a general. MAJOR-GENERAL, rank below lieutenant-general. BRIGADIER-GENERAL, the commander of a brigade. GENERAL AGENT (see AGENT; PRINCIPAL AND AGENT)—GENERAL COUNCIL (see PRIVY COUNCIL)—GEN′ERALIS′SIMO, n. *-ĭs′ĭ-mō* [It.]: the chief general of two or more armies acting in the same war. GEN′ERALIZE, v. *-īz*, to extend from particulars to whole kinds or classes; to infer from the nature of one or a few, the nature of several or the whole. GEN′ERALI′ZING, imp. ADJ. tending to or consisting in generalization: N. the act or process by which we comprehend under a common name several objects agreeing in some point, which that common name serves to indicate. GEN′ERALIZED, pp. *-īzd.* GEN′ERALIZA′TION, n. *-zā′shŭn*, deducing a general principle from a series of facts; act or process of grouping particulars in a genus; act of comprehending under a common name several objects agreeing in some point.

GENERAL: (1) A military rank and title. In the United States army, this rank, as distinguished from and superior to the major-general, was created for Washington by Congress, 1799, March 3. He died shortly after, the office remained vacant, and in 1802 it was abolished. It was revived in 1866 for Grant, and on his accession to the Presidency in 1869, was conferred on William T. Sherman. On his retirement 1883, Nov. 1, the rank was allowed to lapse. In June 1888 is was revived for Philip H. Sheridan; but on his death in August it again became extinct. The highest army officer has now the title of chief of staff. See GENERAL STAFF, UNITED STATES ARMY.

(2) The name given to the general superior of religious orders and congregations of men in the Roman Catholic Church. The general is usually elected in general chapter, and holds office for three years. In the Society of Jesus the general is elected for life. The generals of regular orders have been granted by popes special privileges, as power of absolution in reserved cases in relation to their subjects. Several modern congregations of women have general superiors, but their canonical position is quite different from that of the generals of the orders of men.

GENERAL ASSEMBLY. See PRESBYTERIANS.

GENERAL CONFESSION, in the Roman Catholic Church, is a sacramental confession of all sins committed by the penitent since baptism, or since of an age to know what sin is, so far as he can remember. Such general confession is made by persons who have made no previous confession, who have wilfully concealed a mortal sin; or been wanting in true and supernatural sorrow for the sins confessed in a previous confession; or are desirous of reviewing their past life for the purpose of interior advancement in the spiritual life.

GENERAL CONVENTION OF THE PROTESTANT EPISCOPAL CHURCH in the United States: chief governing body of that church. From the settlement of Jamestown, 1607, to the achievement of national independence, Episcopalians in this country were a part of the Church of England, and were under the supervision of the Bp. of London. But 1784, Oct., a convention of clerical and lay delegates from the states of N. Y., N. J., Penn., Del., and Md., met in the city of New York, and, having adopted a statement of general principles which prepared the way for the organization of all Episcopalians in the United States into a branch of the church of Christ, adjourned to meet in Philadelphia the following year. At that time and place additional delegates were present from S. C. and Va. The first General Convention (1789) chose as its president Bp. White, of Penn., who, with Bp. Provoost, of N. Y., had been consecrated in England two years before. Bp. Seabury, of Conn., also, who had been consecrated by Scottish bishops, was recognized as a member of the convention. Under the constitution then adopted the convention, representing the entire Episcopal church in the United States, has continued

to meet every three years. It is composed: 1. Of all the bishops of the Prot. Epis. church, who constitute a separate house; and 2, of four clerical and four lay deputies from each diocese. All dioceses, as well as missionary jurisdictions (prospective dioceses) are represented. Legislative action is accomplished by concurrent votes of both houses, and (when published) must be authenticated by both. The constitution amended from time to time by the convention, continues substantially as originally adopted. With the growth and extension of the Prot. Episc. church of the country, and of the domestic and foreign missionary work, the convention, as the governing council, has greatly expanded and strengthened its jurisdiction and control. In doing so it has, as some writers think, transcended the powers originally conferred upon it: others maintain that those powers are general and have been lawfully expanded and strengthened to meet the exigencies and opportunities of the times. See EPISCOPAL CHURCH, PROTESTANT.

GENERAL COURT, the official name of the legislature of Massachusetts. The old English name of the meeting of a body of managers or members of any corporation is 'court'; as court of aldermen, court of directors, etc. So the meeting of corporators of the old Massachusetts Company was called a court; then the primary assembly of freemen under its charter was called the General Court; and the name was retained after it became a representative body. There was the further reason that it really was the supreme judicial as well as legislative body.

GENERALE, or GENERAL, n. *jĕn'ĕr-âl'* [F. *générale*, the general: Sp. *generála*, a beat of the drum to arms—from L. *generālis*, of or relating to all (see GENERAL)]: the tune played by drums and fifes immediately before a battalion of infantry falls in for the march.

GENERAL EDUCATION BOARD founded in New York City, February, 1902, chartered by Congress 1903, Jan. 12, has for its objects: (1) The promotion of education within the United States of America, without distinction of race, sex or creed; (2) the development of the public school system, especially in rural districts; (3) the development of the principle of self-help by promoting increased local taxation, local contributions or other means for educational purposes; (4) the increased establishment of training schools for teachers, especially those designed to educate instructors of industrial and manual training; (5) co-operation with the organizations interested in educational work, so as to simplify and make effective the general work of education, avoiding unnecessary duplication; (6) the collection of full information and statistics in respect to educational matters in the districts covered by the operation of the board, which shall be kept at a general office; (7) to furnish the public with information, suggestions and counsel, and for this purpose to act somewhat as a clearing-house for educational statistics and data to be collated by the board; (8) to

educate public opinion in all matters pertaining to the general cause of education by publication of reports through the daily press and by other means.

The organization received the cordial support and gifts of several philanthropists, including John D. Rockefeller, Sr. When the charter with its broad provisions was signed by President Roosevelt, John D. Rockefeller made a special gift of $1,000,000 for exclusive distribution in educational work among the southern states, where the operations of the board were mainly confined at first. The intelligence, fidelity and efficiency with which this trust was discharged led Mr. Rockefeller, in 1905, to announce a further contribution to the General Education Board of $10,000,000, the principal to be held in perpetuity as a foundation for education, the income, above expenses and administration, to be distributed to or used for the benefit of institutions of learning, such amounts to promote a comprehensive system of higher education in the United States. In 1907 Mr. Rockefeller further gifted the sum of $32,000,000, one-third of the income to go to the endowment fund, the remainder as he or his son may direct. In 1909 he gave $10,000,000 more.

GENERAL IS'SUE, in Law: form in which the defendant traverses or meets with a simple denial all the allegations, or the principal fact on which the plaintiff relies in his declaration. Thus, in actions founded on wrongs, the general issue is 'Not Guilty;' in actions of debt, that the defendant never was indebted; in actions on a deed or bond, *non est factum*, i.e., that it is not the deed of the defendant. Under this issue, the defendant may prove that he never executed the deed; but not that it is bad in point of law. In *criminal proceedings*, the general issue is 'Not Guilty,' by which plea, without further form, every person, on being arraigned on any indictment for treason, felony, or piracy, is deemed to have put himself upon the country for trial: where a prisoner refuses to plead, a plea Not Guilty may be entered for him. Under the plea Not Guilty, the prisoner is entitled to give in evidence not only everything which negatives the charge, but also all matter of excuse or justification.

GENERALIZATION, in philosophy, n. *jĕn'ėr-al-ĭ-zā'-shŭn*. [Lat. *generalis*, from *genus*, kind]: 1. The act of recognizing a characteristic as being common to two or more objects; the formation of a general principle from particulars; the obtaining of a rule or law by analysis of individual cases. 2. The principle or notion resulting from the act of generalizing.

The term Generalization is broadly used for all the different ways of arriving at a universal judgment; in a more specialized use it coincides with the term Induction (q.v.). Generalization is a synthetic mental process in that individuals are thought together through their common character; it is an analytic process in that this common character is singled out from a multitude of characters, at

the moment non-essential, in order to be made the basis for synthesis (classification). Generalization is a specialized form of association; its value to experience is that the relevant past is brought to bear upon the present. *E.g.* an intimate knowledge of wild pigeons enabled Darwin to interpret the phenomenon of a 'sport' in his flock of pigeons; by recognizing the characters common to the 'sport' and the rock pigeons the illuminating general notion was obtained that they had a common origin. Generalization is found not only to interpret the present experience, but also to give additional meaning to past experiences, to the particulars which form the basis for the generalization. Particular observations of falling apples, rotating planets and changing tides, being analyzed and their common character found, led to the generalization called the Law of Gravitation; the formulation of the law shed new light upon apples, planets and tides.

The history of generalization in logic is interesting. The process was recognized and described by Aristotle. It was a problem of the Scholastics whether finite minds could reach valid (true) generalizations. This problem is the rock upon which Hume's psychological ship founders, destroying the last hope of the English Association School. In Kant's postulate of an active mind, as opposed to Locke's assumption of a passive mind, we have the basis for the modern psychological theories of the synthetic and analytic mental activities.

The product of a generalizing activity is variously called (depending upon point of view), *concept, general idea, notion, law, principle.* The product, taken in and by itself, is always a particular,—*a* law, *a* concept—capable, however, of being applied to all the individuals from which it was derived; capable, also, of being applied to all other individuals that may hereafter be found to have the essential characteristic. Though the concept is a particular mental experience, that does not mean that there are particular physical objects corresponding to it. The general idea denominated 'animal' has nowhere in the external world a corresponding living being possessing only the characters common to all animals and no individual characters of its own. Neither do there exist, independent of particular physical beings, 'ideas' or 'forms' which give pattern to these individuals. The debates of the Conceptualists and Nominalists arose from a misconception of the nature of mental activity.

GENERAL LIEN, in Law: lien 'which the holder thereof is entitled to enforce as a security for the performance of all the obligations, or all of a particular class of obligations, which exist in his favor against the owner of property. A General Lien does not necessarily arise (as does a specific lien) from some demand which the creditor has in respect to the property upon which the lien is claimed, but is one for a general balance of accounts. A General Lien may exist: 1, where there is an express contract; 2, where it is implied from the usage of trade; 3,

from the manner of dealing between the parties in the particular case; or, 4, where the defendant has acted as a factor. The principal general liens are those of factors, brokers, bankers, of attorneys upon their clients' papers and money, and of warehouse men and wharfingers.' A specific lien is one which 'attaches to specific property as a security for some demands which the creditor has in respect to that property.' See LIEN.

GENERAL NOTION. See CONCEPT and GENERALIZATION.

GENERAL RULES OF THE METHODIST EPISCOPAL CHURCH: body of regulations in substance the same as drawn up by Mr. Wesley at London, 1739, at the beginning of his work in preaching the gospel. That he might be able to instruct carefully those who in increasing numbers sought his counsel, he appointed stated times at which they could meet him together. This was the origin of 'the United Society,' first in England, afterward in America. Such a society is simply a company of persons united to pray together, receive exhortation, and help each other to work out their salvation. Each society is divided into classes of about 12 persons, one of whom is called the leader. It is his duty: 1, To see each member of his class at least once a week; to instruct, exhort, reprove, and comfort them; and to receive their voluntary offerings for the support of the gospel and for the care of the poor; 2, To meet the minister and stewards of the society, also once a week, in order to give the former all required information, and to pay over to the latter the amounts received from their class during the preceding week. From those who ask admission into these societies only one condition is required—'a desire to flee from the wrath to come and to be saved from their sins.' But as this desire, if it be cherished in the soul, will be shown by its fruits, the members of the society are expected to show their continued seeking of salvation: 1, By shunning every kind of evil; 2, By doing all possible kinds of good and as far as possible to all men; 3, By attending upon all the ordinances of God. Under these three classes of requirements the rules give full and comprehensive particulars, illustrated and enforced by appropriate reference to 'the written word of God as the only and sufficient rule of faith and practice.' These are published as the general rules for the guidance of every member of a Methodist society. If any one habitually break them, another rule directs that his brethren admonish, pray for, and bear with him for a season; but if then he do not repent he can have no more place among them.

GENERAL SERVICE AND STAFF COLLEGE, United States army, a training school for young officers of the United States army, located at Fort Leavenworth, Kan. Graduates from West Point are sent here for a further study of the profession of arms, and a more practical and theoretical training from the standpoint of the officer. Upon completing the course of study an officer returns to duty with his regiment. The course of study is two

years. At graduation the student class is divided into two classes, the 'distinguished' class and the 'proficient' class, the former becoming available for detail at the War College at Washington.

GEN'ERAL SHIP: ship advertised by the owners to take goods from a particular port at a particular time, and not under any special contract to particular merchants. The owners, in this case, engage separately with each merchant who applies to them to convey his goods to the ship's destination. The contract between the owners or the master acting in their behalf, and the proprietors of the goods, may in the case of general ship be established by parole evidence, and, indeed, there is rarely any writing on the subject except advertisement and the bill of lading. In a general ship the master being intrusted by the owners with full power to contract for and take in goods, no agreement for freight which any one may have made with the owners independently of him, will be effectual to secure room in the vessel. All such agreements must be intimated to the master, or those acting for him on board, before he has engaged freight for the whole vessel: by such intimation, a preference will be secured over the merchant who brings his goods to the ship's side on chance. If the owners of a general ship have advertised her as bound for a particular port, they must give specific notice to every person who may ship goods on board, of any alteration in her destination, and they will be liable for the consequences of neglecting to do so.

GENERAL STAFF OF THE ARMY, in the United States. During the early years of the United States the army was insignificant in proportions, but the business of the War Department gradually grew in volume until it was necessary to adopt some measures to save the secretary of war from being crushed by the burden of current routine work. In groping for some method which would relieve the secretary, the bureau system with numerous semi-independent chiefs was introduced. These bureaus were few in number at the beginning but gradually grew until at the commencement of war with Spain there were 10 chiefs of bureaus directly connected with the administration and supply of the army, each working along his own lines without of necessity having any knowledge of the character and extent of allied work going on in other bureaus. Chiefs of bureaus found themselves constantly hampered by reason of lack of information. Not by law but as a matter of expediency all looked to the adjutant general for information, but chiefs of bureaus claimed that the secretary of war alone was competent to give them orders or instructions.

After a patient and exhaustive study of the situation the secretary of war concluded that the more important duties of a general staff could be performed by a war college and its governing board. In furtherance of this idea a board of officers was convened to consider and recommend regulations for the establishment of an army war

college. After mature study of the situation the board formulated a memorandum of an order for the execution of the project but unanimously recommended that a general staff be established by appropriate legislation which would free it from the uncertain tenure adhering to the war college which exists only by executive authority. Out of these studies and efforts have come the law known as the General Staff Bill, which passed the Congress and was approved by the President 1903, Feb. 16.

Under this law the chief of staff, regardless of his relative rank, is the adviser and representative of the secretary of war, occupying a position between that official and the staff bureaus as well as the line of the army. Instead of 10 chiefs of bureaus and their numerous assistants having frequent interviews with the secretary concerning military affairs, the chief of staff has authority to adjust professional matters in the secretary's name. Conflicting elements of the larger administrative questions are thus brought together and harmonized without taking up the valuable time of the civilian secretary, who must of necessity acquaint himself concerning numerous technical details before undertaking to decide matters at issue.

The duties of the general staff consist, in peace, to a great extent, of bureau work—including the collection of information, preparation of maps, drawing up schemes for the organization and concentration of troops, formulation of plans for the national defense and a study of the higher military science to keep pace with modern progress.

GENERAL THEOLOGICAL SEMINARY OF THE PROTESTANT EPISCOPAL CHURCH in the United States: established by the general convention 1817. Instruction was commenced at New York 1819; in 1820 the institution was removed to New Haven, but two years later was taken back to New York and was incorporated by the N. Y. legislature. Its board of trustees is composed of the bishops of the church, the dean of the seminary, 25 persons elected by the house of deputies at each stated general convention, and 25 elected by certain dioceses on the basis of their former contributions to the seminary. The regular studies extend through 3 years, with additional courses for post-graduates and for special students. The buildings, substantial and commodious, are on Chelsea Square, 9th Avenue, between 20th and 21st streets.

GENERATE, v. *jĕn′ĕr-āt* [L. *genĕrātŭs*, begotten, engendered; *gĕnĕrans*, begetting—from *genus*, race, kind]: to beget; to bring into life; to cause; to produce. GEN′ERATING, imp.: ADJ. producing; forming. GEN′ERATED, pp. GEN′ERATOR, n. *-tėr*, one who or that which. GEN′ERABLE, a. *-ă-bl*, capable of being generated. GEN′ERANT, n. *-ănt*, the begetting or productive power. GEN′ERA′TION, n. *-ā′shŭn* [F.—L.]: the act of begetting (see REPRODUCTION): production; formation; an age; people of the same period; a family; a race; progeny; in *math.*, applied to one geometrical figure when produced or formed by an operation performed upon the other: thus a cone is generated by

making a right-angled triangle revolve about one of its sides adjoining the right angle as an axis.—In arithmetic, similarly, a number is said to be generated when produced by an operation performed on one or more other numbers. Thus, 36 is generated by the involution of 6 to the 2d power, or by the multiplication of 4 and 9. GENERATIONISM: see TRADUCIANISM. GEN'ERATIVE, a. *-tĭv*, that generates or produces; having the power of producing. ETERNAL GENERATION: see TRINITY, DOCTRINE OF THE.

GENERA'TION, SPONTANEOUS: production of living organisms without parents. From the earliest period to the end of the middle ages, no one called in question the doctrine that, under certain favorable conditions, of which putrefaction was one of the most important, animals might be produced without parents. Anaximander and Empedocles attributed to this form of generation all the living beings which first peopled the globe. Aristotle, without committing himself to so general a view, maintains that animals are sometimes formed in putrefying soil, sometimes in plants, and sometimes in the fluids of other animals, and lays down the following general principal, 'that every dry substance which becomes moist, and every moist body which is dried, produces living creatures, provided it is fit for nourishing them.' The views of Lucretius on this subject are shown in the following lines:

> Nonne vides quæcunque morâ, fluidoque liquore
> Corpora tabuerint, in parva animalia verti?

And Pliny maintains that 'quædam gignuntur ex non genitis, et sine ullâ simili origine.' Virgil's directions for the production of bees are known to every reader of the *Georgics*, and an expression in the Old Testament (Judges xiv. 14) has been on vague reasons thought to point to a similar opinion as held by Samson. In the later period of the middle ages, and the two succeeding centuries, among advocates of this theory, were Cardan—who, in his treatise *De Subtilitate* (1542), asserts that water engenders fishes, and that many animals spring from fermentation—Aldrovandus, Licetus, Gassendi, Scaliger, Van Helmont, who gives special instructions for the artificial production of mice, and Kircher, who in his *Mundus Subterraneus* (in the chapter 'De Panspermia Rerum') describes, and actually figures, certain animals which were produced under his own eyes by the transforming influence of water on fragments of the stems of different plants!

Redi, celebrated Italian naturalist, whose *Experiments on the Generation of Insects* were published 1668, seems to have been the first opponent that the doctrine of spontaneous generation encountered. In this work, he proves that the worms and insects which appear in decaying substances are in reality developed from eggs, deposited in those substances by the parents. Leuwenhoek, Vallisneri, Swammerdam, and other eminent naturalists, soon contributed additional facts and arguments in favor of Redi's view; and as from the time of Redi to the present day, the tide of opinion has generally turned strongly against the doc-

trine in question, it is unnecessary to carry the historical sketch further. The entozoa, however, continued to be a great stumbling-block. 'When,' says Prof. Owen, 'the entozoologist contemplated the *tænia* fixed to the intestine, with its uncinated and suctorious head buried in the mucous membrane, rooted to the spot, and imbibing nourishment like a plant—when he saw the sluggish *distoma* (or fluke, adhering by its sucker to the serous membrane of a closed internal cavity, he naturally asked himself how they got there; and finding no obvious solution to the difficulty of the transit on the part of such animals, he was driven to the hypothesis of spontaneous generation to solve the difficulty. It is no wonder that Rudolphi (1808) and Bremser (1824), who studied the entozoa rather as naturalists than physiologists, should have been led to apply to them the easy explanation which Aristotle had given for the coming into being of all kinds of Vermes—viz., that they were spontaneously generated. No other explanation, in the then state of the knowledge of the development of the entozoa appeared to be adequate to account for the fact of their getting into the interior cavities and tissues of higher animals.' The investigations of Von Siebold, Küchenmeister, Van Beneden, Phillipi, etc., regarding the development and metamorphoses of the entozoa, however, tended to remove all the difficulties which this subject presented; and the advocates of spontaneous generation were fairly driven from this, one of the last of their battle-fields.

Spontaneous generation has been proved to be untenable as an explanation of biological phenomena whose progress we may observe, and consequently we still know nothing of the original development of living things. Yet the doctrine of evolution as a working formula for the universe is incomplete without the important link of the origin of organic from inorganic matter. The testimony of all recent biological discussion has been to assume a process of natural conversion of inorganic into organic matter in the eozoic age. The whole question is now recognized as one in which chemistry must go hand in hand with biology.

GENERATIONS, Alternation of: phrase devised by Steenstrup, Danish naturalist, about 1840, to signify 'the remarkable and till now inexplicable natural phenomenon of an animal producing an offspring, which at no time resembles its parent, but which, on the other hand, itself brings forth a progeny which returns in its form and nature to the parent animal, so that the maternal animal does not meet with its resemblance in its own brood, but in its descendants in the second, third, or fourth degree or generation; this always taking place in the different animals which exhibit the phenomenon in a *determinate* generation, or with the intervention of a *determinate* number of generations.' The phenomenon has been observed in many of the *hydrozoa*, in various *entozoa*, in *annelids*, in *molluskoids* (*salpœ*), and in insects (*aphides*). An illustration is the development of the *medusæ* or *jelly fishes*,

which belong to the class *hydrozoa*. The medusa discharges living young, which, after having burst the covering of the egg, swim about freely for some time in the body of the mother. When first discharged or born, they have no resemblance whatever to the perfect medusæ, but are little cylindrical bodies (Fig. 1, *a*), covered with cilia, moving with considerable rapidity, and resembling infusoria. After moving freely in the water for some days, each little animal fixes itself to some object by one extremity (*e*), while at the opposite extremity a depression is gradually formed, the four corners (*b*, *f*) becoming elongated, and gradually transformed into tentacles (*c*). These tentacles increase in number till the whole of the upper margin is covered with them (*g*). Transverse wrinkles are then seen on the body at regular intervals, appearing first above, and then extending downward. As these wrinkles grow deeper, the edge of each segment presents a toothed appearance, so that the organism resembles an artichoke or pine-cone, surmounted by a tuft of tentacles (*h*). The segments gradually become more

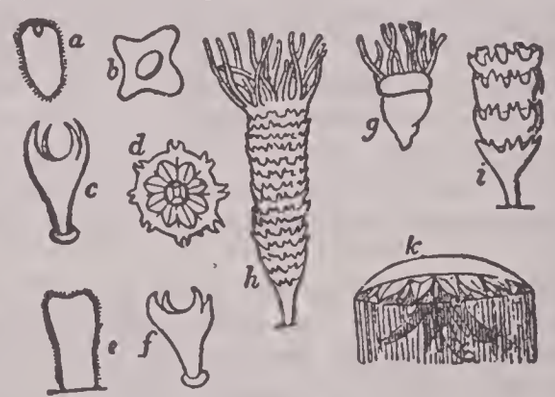


Fig. 1.

separated until they are united by only a very slender axis, when they resemble a pile of shallow cups placed within each other (*i*). At length the upper segment disengages itself, and then the others in succession. Each segment (*d*) continues to develop itself until it becomes a complete medusa (*k*); while the basis of stalk remains, and produces a new colony. Here, then, we have the egg of the medusa gradually developed into the polypoid organism (*h*), to which the term *strobila* (from *strobilos*, a pine-cone) has been given. This polyp, by gemmation and fission, yields medusæ with reproductive organs.

The phenomenon of alternation of generations is presented in the Cestoid Worms (see under CESTOID) and in certain Trematoid Worms (see FLUKE); and is seen also in TAPE-WORMS (q.v.). The fission of certain annelids (Syllis and Myrianida) (see REPRODUCTION), presents an example, though at first sight a less obvious one, of alternation of generations, the non-sexual parent worm yielding by fissure progeny containing spermatozoa and ova, from which again a non-sexual generation is produced.

The *Salpæ* (*mollusca* or *molluscoids* belonging to the fami-

ly *Tunicata*) are regarded usually as affording a good illustration of the phenomenon under consideration. It was in these animals that it was originally noticed by Chamisso, who accompanied Kotzebue in his voyage round the world (1815–18). The Salpæ (20 to 40 in number) are united together by special organs of attachment, so as to form long chains, which float in the sea, the mouth (*m*), however, being free in each. The individuals thus joined

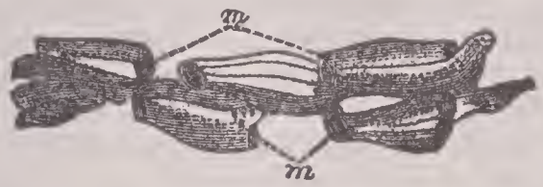


Fig. 2, A.

in chains (Fig. 2, A) produce eggs; one egg being generally developed in the body of each animal. This egg, when hatched, produces a little mollusk (Fig. 2, B), which remains solitary, differs in many respects from the parent, does not produce an egg, but propagates by a kind of internal gemmation, which gives rise to chains already seen within the body of the parent, which finally bursts and liberates them. These chains again bring forth solitary individuals.

Fig. 2, B.

The chief instance in which this phenomenon occurs in animals so highly organized as insects is in the *Aphides*, or Plant-lice. In many species of the genus *aphis*, which in the perfect state possess wings, a large proportion of the individuals never acquire these organs, but remain in the condition of larvæ. These without any sexual union (none of them, indeed, being males) bring forth during the summer living young ones resembling themselves; and these young ones repeat the process, till ten or eleven successive broods are thus produced; the last progeny, toward the end of the summer, being winged males and females, which produce fruitful eggs that retain their vitality during the winter, and give birth to a new generation in the spring, long after their parents have perished. Another instance is the *Cynips* or Gall-fly. Hofmeister discovered an alternation of generations in plants. It occurs among the liverworts, mosses, ferns, and phanerogams. For alteration of generations Owen invented the term METAGENESIS (q.v.), and Spencer, HETEROGENESIS (q.v.) or HETEROGYNY.

Cycle of Generations is a truer term than alternation of generations; as there may be four changes between one generation and the next for several series. Many authorities object to the term 'alternation of generations.' The detached portions of the stock originating in a single generative act are termed *Zöoids* by these writers, while by the term *animal* or *entire animal* (the equivalent of *Zöon*) they understand in the lower tribes, as in the higher, *the collective product of a single generative act.* Here they include

under the title of *one generation* all that intervenes between one generative act and the next. 'If,' says Dr. Carpenter, 'the phenomena be viewed under this aspect, it will be obvious that the so-called "alternation of generations" has no real existence; since in every case the whole series of forms which is evolved by continuous development from one generative act repeats itself precisely in the products of the next generative act. The alternation, which is very frequently presented in the forms of the lower animals, is between the products of the *generative act* and the products of *gemmation*, and the most important difference between them usually consists in this—that the former do not contain the generative apparatus which is evolved in the latter alone. The generating zöoid may be merely a segment cast off from the body at large, as in the case of the *Tapeworms* (q.v.), or it may contain a combination of generative and locomotive organs, as in the self-dividing *Annelide*. It may possess, however, not merely locomotive organs, but a complete nutritive apparatus of its own, which is the case in all those instances in which the zöoid is cast off in an early stage of its development, and has to attain an increased size, and frequently also to evolve the generative organs, subsequently to its detachment; of this we have examples in the *Medusæ* budded off from Hydroid Polypes, and in the aggregate *Salpæ*.' For fuller details see Belfour's *Embryology* (1880–1); J. V. Carus, *Zur nähern kenntniss des Generationswechsels* (Leipszig 1849); J. J. S. Steenstrup, *On the Alternation of Generations*, English translation by Busk (London 1845); R. Leuckart, *Uber den Polymorphismus der Individuen*, etc.; *ein Betrag zur Lehre von Generationswechsels* (Geissen 1851).

GENERATIVE CELLS: the term generative cell is used in a very general sense but technically is applied in seed plants to the first cell which makes its appearance in the sperm series. In gymnosperms (pines and their allies) the term is applied to that cell which divides to form the stalk and body cells, the male cells being formed by a subsequent subdivision of the body cells. In angiosperms (true flowering plants), that cell which is formed by the first division of the nucleus of the pollen-grain and which in turn by division immediately forms the male cell, is known as the generative cell.

GENERATOR, (1) An apparatus for generating carbonic acid gas for charging soda-fountains or bottles with aërated water. (2) In chemistry, a term used to denote the elements or compounds from which a more complex substance is obtained. Thus ethyl, alcohol, and acetic acid are the generators of acetic ether; and benzoic acid and glycocoll are the generators of hippuric acid. (3) In distilling, a retort in which volatile hydrocarbons are distilled from liquid or solid matters. (4) In electricity, a dynamo-electric machine. (5) In steam, a vessel in which steam is generated from water, for use in a steam engine, a heating apparatus, etc. The term was first

applied to the Perkins steam boiler, in which water in small quantity was heated to a high temperature. It is now specifically applied to a class of instantaneous generators. The name is now rapidly coming into use for all apparatus for generating steam, being held to be more correct than the usual term. See STEAM.

GENERIC, a. *jĕ-nĕr′ĭk* [L. *genus*, race, kind, *genĕris*, of a race or kind: F. *générique:* It. *generico*]: pertaining to a genus or kind; consisting in the classification of objects under genera, as opposed to species; also GENER′ICAL, a. *-nĕr′ĭ-kăl.* GENER′ICALLY, ad. *-lĭ.* GENERIC-AREA, in *bot.*, *zool.*, and *geog.*, an area to which a genus is limited. When there is one spot within this area where representatives of the genus abound more than in other parts, it is called the metropolis.

GENERIC IMAGE, in Psychology: Certain psychologists hold that the mind possesses images which, like composite photographs, are mainly revivals of the features common to a number of objects. The generic visual image of dog would be a mental picture of a number of dogs, as these would appear photographed one after the other on a single sensitive plate. Such pictures are blurred in detail, but conspicuous common parts like head, body and tail appear plainly.

GENEROUS, a. *jĕn′ĕr-ŭs* [F. *généreux*—from L. *genĕrōsŭs*, of good or noble birth, generous—from *genus*, kind, race: It. *generoso*]: liberal; bountiful; excellent; open-hearted; strong or invigorating in its nature. GEN′EROUSLY, ad. *-lĭ.* GEN′EROUSNESS, n. *-nĕs.* GEN′EROS′ITY, n. *-ŏs′ĭ-tĭ*, a disposition to give liberally, or to bestow favors; a quality of the heart opposed to meanness or parsimony.—SYN. of 'generous': beneficent; munificent; benevolent; noble; honorable; magnanimous; spirited; abundant; plentiful; overflowing; strong; exciting.

GENESEE, *jĕn-ė-sē′:* river, rising, about 10 m. s. of the boundary between Penn. and N.Y. It flows n. through the w. portion of N. Y., and after a course of 145 m. falls into Lake Ontario, 7 m. n. of the city of Rochester. The Genesee is notable not only for the varied and romantic character of its scenery, but also for its extraordinary falls. Of these falls, five in number, three, occurring within a distance of two miles, in the vicinity of the town of Portage, about 90 m. from the mouth of the river, are respectively 60, 90, and 110 ft. high. The other two, one immediately above Rochester, and the other about 3 m. below that city, are each about 100 ft. high.

GENESEO, N. Y., a village and county-seat of Livingston County, 30 miles from Rochester, on the Genesee River and the Erie R.R. The State Normal School and Wadsworth Public Library, with about 13,000 volumes and an interesting collection of curios belonging to the County Historical Society, are situated here. It is an agricultural town and manufactures gloves, mittens, flour, and machines. Pop. (1910) 2,067.

GENESIS.

GENESIS, n. *jĕn′ĕ-sĭs* [Gr. *genĕsis*, origin, source—from *gĕnnăō*, I cause or produce]: the first book of the Old Testament Scriptures, giving the history of the creation of the world and of man, etc.; the act of producing; a production or formation; evolution. GENETIC, a. *jĕ-nĕt′ĭk*, pertaining to origin or mode of production of a thing. GENETICAL, a. *jĕ-nĕt′ĭ-kăl*, same as *genetic*. GENETICALLY, ad. *-kăl-lĭ*, in reference to the origin, descent, or mode of production.

GEN′ESIS, or more fully GENESIS KOSMOU (Origin, Generation of the World): name given first by the Septuagint to the opening book of the Pentateuch and of the Old Testament. In the Hebrew canon it is called *Bereshith* (In the Beginning), from the initial word; in the Talmud, it is sometimes referred to as 'The Book of Creation,' or 'The Book of Abraham, Isaac, and Jacob.' Its Masoretic division into 50 chapters, followed in the English Bible, or into 12 large or 43 small encyclical sections (*Sedarim, Parshioth*), has been grounded rather on convenience than on any corresponding division of the subject-matter. The book seems of itself to fall most naturally into two totally distinct parts; the first of which would extend from the beginning to the call of Abraham (i.—xii.), and embrace the account of the creation, paradise, fall, the generations between Adam and Noah, together with their religion, arts, settlements, and genealogy, the deluge, the repeopling of the earth, the tower of Babel, the dispersion of the human race, and the generations between Noah and Abraham; thus forming an introduction to the second part (xii.—l.), or the history of the patriarchs (Abraham, Lot, Ishmael, Isaac, Jacob, Esau, and Joseph); the whole concluding with the settlement of Jacob's family in Egypt. Another division seems indicated by the inscription *Toledoth* (Origin, Generation), which occurs ten times in the course of the book, introducing at each repetition a new cycle of the narrative, and which would thus divide the whole (after ii. 4) into ten distinct sections of disproportionate length.

The period of time over which the Book of G. extends has been variously computed; the number of years commonly assigned to it is about 2,300; Bishop Hales, following the Septuagint, reckons 3,619 years. In truth, however, the book gives no chronology: it purports to relate not dates of the events but the *order* of events (see CHRONOLOGY).

Being a portion, and the introductory portion of the Pentateuch—at the same time that it forms a complete whole in itself—G. cannot but be considered as laying down the basis for that theocracy of which the development is recorded in the succeeding books. While the design and plan of the Pentateuch is thus also that of G., the latter, however discordant its constituent parts may seem, does not lack the necessary unity. Beginning with the cosmogony, or rather geogony, i. e., the generation of the earth with its animate and inanimate products, and all created things which bear upon and influence it visibly (see COSMOGONY), the record gradually narrows into the history of man, and with the distinct aim of tracing the

fate of the one chosen family and people, it singles out Noah, Abraham, Isaac, Jacob. The narrative dwells with careful minuteness upon their fortunes, laying especial stress on their recognition of the living God and their confidence in Him, and in the case of the last three, on the reiterated promises of the land which they should inherit: 'they and their seed after them.' The remainder of the human race is summarily treated of; the various founders of tribes and peoples that represent it being generally but briefly named. It is only in the case of brothers, or very near relations of the elect, that certain incidents of their lives are more fully recorded; plainly with the intention of proving the inferiority of their claims to divine consideration, or even of representing them as meet objects of the displeasure of the Almighty: e.g. Ham, Ishmael, Esau. From chapter xxxvii. to the end of the book, we have exclusively the one chosen family of Jacob and his children before our eyes; and the strictly national character, which the narrative now assumes, excludes everything but the fortunes of this particular house. Here, also, an unbroken, flowing style takes the place of the former apparently sketchy and sometimes abrupt manner. With the occupation by Jacob's rapidly developing tribe of the land of Goshen, this first great patriarchal period is brought to a fitting close, and the second ushered in, when the tribe reappears after a lapse of time as a people. The Maker of all things, having by the creation of one man and one woman in His own likeness placed all mankind on an equal footing from which they voluntarily fell into ungodliness —He in the sovereignty of His grace selected from the mass of human corruption one righteous man—one man who recognized God in faith; and through this man's progeny—whose history is told at length—mankind is in the end to be reclaimed:—this seems the pith of the book, considered as a religious history of man.

A certain apparent difference of style and language; the occurrence of what seemed gaps on the one, and repetitions and contradictions on the other hand; the special headings (*Toledoth*) above mentioned; and lastly, the use of different terms for the divine name, led very early to the question of the integrity of Genesis. Celsus, Isaac, C. Jasos, Aben Esra, Karlsstadt, Spinoza, all assumed smaller or larger interpolations; that is, pieces evidently not written by the author of the book himself, but added afterward. It was not before 1753 that the 'Hypothesis of Documents,' based on the alternate use of the word *Jehova* (Self-existent, and Ever-manifesting) and *Elohim* (Almighty) was broached. While the Talmud, Tertullian, St. Augustine, Chrysostom, Jehudah Hallevi, etc., all had endeavored to explain how the individual word was always necessary in the special passage where it occurred, Astruc, a Belgian physician, published in that year his *Conjectures sur les Mémoires originaux dont il paroit que Moyse s'est servie pour composer le livre des Genèse*, in which he endeavored to show that this writer, or rather editor of the book, had made use of two large and ten small—respectively 'Elohistic' and

'Jehovistic'—documents for his composition. This theory was at first received with silent contempt in the writer's own country. The only man who took any notice of it was Charban, who at the same time excused himself for refuting this 'absurd but dangerous' theory. It soon, however, found its way to Germany, where it was warmly advocated and developed by Eichhorn (*Repert.* and *Introd.*), Ilgen, and Gramberg. A further step was taken by Vater and Hartmann, to whom belongs the 'Hypothesis of Fragments,' or of the whole Pentateuch being a Mosaic of fragments by various authors. Both these notions have now been generally rejected, for various reasons, but chiefly on account of their incompatibility with the evident unity of the whole work and its single parts. The theory adopted by the majority of biblical critics of our day, among whom are Wette, Lengerke, Knobel, Stähelin, Bleek, Tuch, Deltizsch, and Bunsen, with a host of others, is the 'Complementary,' according to which the author of the Pentateuch —the Jehovist—had worked upon an old Elohistic fundamental record which embraced the time from the creation to the death of Joshua, altering, enlarging, and completely rewriting it. Ewald and Hupfeld, however, assume four writers; the former two Elohists and two Jehovists, the latter three Elohists and one Jehovist; while the apologetic school of Hengstenberg, Hävernick, Keil, attempts to uphold the primitive theory of a single author.

Considered from the remotest time as a book written under the influence of divine inspiration—a term very differently understood—and thus raised above all doubt as to its truthfulness, various efforts were made, from the days of the earliest interpreters to our own day, to explain, by allegory and symbol, such of its statements as in their plain sense seemed incomprehensible to human understanding. Philo and the Alexandrines generally, Papias, Irenæus, Justin Martyr, and others, in all seriousness spiritualized into divine parable that which was given as history; so much so, that St. Augustine—exemplifying the spirit of the times—shortly after his conversion, explains paradise to represent nothing more than the happiness of mankind, the four rivers the four virtues, the serpent the devil, the coats of skin immortality, etc. In more recent times, however, after Luther had restored the belief in the literal meaning of the text, some have returned to the ancient theory of allegory and symbol, above noted; and some have gone so far as to refer all that is not within the grasp of their reason and the sphere of their present knowledge, to the region of myth, and to point to the obvious similarity between the biblical narrative of the paradise, its four rivers, the serpent, the apple, the fall, etc.; and certain legends, common to most eastern nations in the remotest times, as a proof that they all were derived from one and the same mythical source. Since the revival of science in the 16th c., and especially since the first quarter of the last century, another, and what was at first deemed a much graver difficulty, has arisen—viz., how certain distinct and explicit statements of the Scripture were to be reconciled with certain undeniable

physical facts; and in particular, the Mosaic cosmogony, in the opening chapters of Genesis, has been brought into violent controversies. The age of the world, supposed to be given by Moses at 6,000 to 8,000 years; its creation and the formation of the whole system of the universe in six of our common days; these were declared by astronomers and geologists to be narratives of the impossible and absurd. This phase of controversy has already passed by: many believers in the biblical record conceding that the book was given not for scientific but only for religious instruction (these have tended often to the spiritual or allegorical interpretation); while others have set forth a reconciliation between Genesis, literally interpreted, and science. Two principal methods of reconciliation have been advanced: Dr. Buckland and his followers adopted and amplified the Chalmerian interpolation of the geological ages before the first day of Genesis (an opinion, strange to say, to be found already in the Midrash (q.v.): 'Before our present world, the Almighty had created worlds upon worlds, and destroyed them again'): Hugh Miller adopted the Cuvierian expansion of the six days into geological ages; some have combined the two schemes. On the other hand, it is asserted both by many of those who hold that the Bible is entirely the work of man, and by those who take it as a mixture of the divine and the human element, that the biblical notion of the cosmogony, as well as of all the other physical phenomena, are simply in accordance with the state of science in the days when the book was compiled. Meanwhile it is pointed out by eminent biblical scholars and men of scientific attainments that the very words of the record in Genesis, so far from being in contradiction to the *facts* of science, convey either directly or by natural implication all that is essential in those facts. It is not claimed by them that all the unproved theories or hypotheses of scientific writers are in consonance with Genesis: thus evolution, so far as it is a fact in nature, with its wide range and important bearings—these Christian scholars say—is not at any point contradicted in Genesis; while the full hypothesis known as "evolution' with its brilliant speculations and assumptions may wait till it is proved before it ranks as science requiring reconciliation with the Scriptures. See COSMOGONY (Biblical).

The apologists adduce, as a further proof of the authenticity of Genesis the surpassing sublimity and moral superiority of its cosmogony as compared with all others. The dualism of God and matter, which, according to the different pagan systems, are either eternally coexistent or fused into each other, is exchanged for the august and moving idea of one personal God, who first created, then molded, and everlastingly sustains the universe, lavishing his highest gifts on man, made in his own image and standing toward God in the living relation of a son to a father. The occurrence of similar traditions in the religious records of other primeval nations is taken as corroborating the historical truth of the biblical account.

The question whether Moses was author or compiler of Genesis has been negatived by some, chiefly on the ground that certain apparently obsolete names mentioned are explained by others which first came into use at a much later time, and that there are allusions made to events which happened centuries after Moses. Graves, Faber, Rosenmüller, and others, consider such passages late additions. On further question whether Moses wrote Genesis while at Midian, or during the 40 days on Mount Sinai, or during the 40 years' sojourn in the desert, see PENTATEUCH, where also some connected points are glanced at. Of opinions on the other side, are notable that of Lengerke, who holds the Elohist to have written under Solomon, and the Jehovist under Hezekiah; of Tuch, who places the former in the time of Saul, the latter in that of Solomon; and of Bleek, who assigns to the Elohist the time of Saul or the Judges, and to the Jehovist the beginning of David's reign.

Of the countless ancient and modern writers who have commented on Genesis, the following are notable: Cyril of Alexandria, Ephraem Syrus, Theodoret, Procopius, Chrysostom, Jerome, Augustine, Rashi-Ezra, Levi b. Gershom, Abrabanel, Mendelssohn, Michaelis, Vater, Bohlen, Rosenmüller, Eichhorn, Augusti, Faber, Graves, Tuch, Knobel, Herder, Delitzsch, Hengstenberg, Keil, Kurtz, De Wette, Bleek, Ewald, Schrader, Wellhausen, Kuenen, Colenso, Davidson. See also Hugh Miller's *Testimony of the Rocks;* Pye Smith's *Relation between Scripture and Science;* Dr. Whewell's *Bridgewater Treatise;* Goodwin's *Mosaic Cosmogony;* Guyot's *Creation,* etc.

GENÊT, or GENEST, EDMOND CHARLES EDOUARD, *ĕd-môn shârl ā-doo-ăr zhĕ-nā,* French diplomat: b. Versailles, France, 1765, Jan. 8; d. Schodack, N. Y., 1834, July 14. In 1777 he translated into French a Swedish history of King Eric XIV. of Sweden, in 1789–92, was French *chargé d'affaires* at St. Petersburg, and from 1793–4, when he was recalled at Washington's request because of attempts to compel the United States to a war with England, was French minister to the United States.

GENET, or GENNET, n. *jĕn'ĕt* [F. *genet*—from Sp. *ginete,* a light-armed horseman]: a small Spanish horse.

GENET, or GENETTE, n. *jĕn-ĕt'* [F. *genette,* a genet—from Ar. *djerneith*], (*Genetta*): genus of quadrupeds of the family *Viverridæ,* nearly allied to the Civets (q.v.), but having only a rudimentary odoriferous pouch, and claws perfectly retractile, as in the *Felidæ.* The approximation to that family appears also in the vertical contraction of the pupil of the eye. The species are numerous; smaller and more slender animals than the civets, natives mostly of Africa and the warmer parts of Asia. One, the common genet (*genet vulgaris*), is found in s. Europe, as well as throughout Africa.

GENETIC, GENETICAL—GENETIC PSYCHOLOGY.

GENETIC, GENETICAL: see under GENESIS.

GENETIC METHOD: that method of scientific study and explanation by which any existing condition or object is treated as a product of earlier processes of evolution. The genetic method of studying a given animal species treats of the descent of this species. The genetic method of studying governments consists in the study of their historical origin and progressive modifications up to the present. This method was first worked out and applied in biology, which science, because of its study of living forms, was chiefly concerned with processes of evolution and development. From biology the method has rapidly spread to all other sciences, so that now it is recognized as one of the leading methods in geology, biology, anthropology, and all of the sciences which have to do with human institutions. It is applicable to certain phases of astronomy, physics, and chemistry. Its application in physics and chemistry has been more productive since the discovery that such substances as uranium and radium pass through series of modifications.

GENETIC PSYCHOLOGY: that phase of psychology which treats of mental evolution and development or of the genesis of consciousness. The term is sometimes applied in a restricted way to the study of mental development in children or child psychology, but this is too narrow an interpretation. Not only children, but also adults, show mental development; and the changes which are observable in human mental development are closely related to the changes which appear in different grades of consciousness as we ascend the animal series from the lower to the higher forms. Wherever there is evidence of development in mental life, therefore, the problem of genesis is a legitimate problem for scientific study.

The sphere of genetic psychology may be defined by contrasting it with that of merely analytical psychology. Analytical psychology aims to discover the elements which are interwoven into any complex mental state. Genetic psychology attempts to trace the steps by which the present state has grown out of earlier states.

Certain typical problems immediately suggest themselves for genetic psychology. First, the question arises, what is the most primitive form of consciousness? Two lines of evidence present themselves as contributing to the solution of this question. One may seek the most primitive forms of his own experience and, second, one may compare the physiological conditions of consciousness in the lowest animals with the physiological conditions of consciousness in the higher forms. The most primitive forms of human experience are such as come to one at the moment when his senses are just beginning to receive impressions as he wakes from sleep. The various sensory elements of consciousness are not discriminated with any degree of clearness, there is no recognition of objects. One's experience cannot be described under such conditions as meager in point of content. There is experience enough,

but it is confused and unarranged; reactions are not definite and clearly related to impression.

Turning to the study of the physiological conditions of consciousness, we find that the lower animals have no highly differentiated organs of sense; light and sound and temperature changes must produce, very much as in the awakening human being, an undiscriminated mass of sensory impression. There is no elaborate central nervous system in which impressions can be related. It is evident that primitive experience must be described as massive, undifferentiated, unorganized.

The second typical problem for genetic psychology is the problem of discovering at what point in the organic series consciousness of any form presents itself. In reply to this question it has sometimes been asserted that all forms of organic tissue are sensitive and hence are conditions of consciousness. Another view which has been defended is that the appearance of consciousness is coincident with the appearance of a specialized nervous structure. Finally, a criterion of intelligence has been set up in the ability of animals to learn new modes of behavior, and consciousness has been described as arising with the first appearance of intelligence. There is doubtless ground for each of these positions. The answer must, from the nature of the case, be hypothetical, since no human being can experience the most primitive form of consciousness, much less observe directly its rise.

More significant than these first questions as to the origin of consciousness are the questions relating to the later development of mental powers. All that is described by such common words as learning, habit, practice, properly falls within the scope of genetic study. The details of the processes of learning and practice are by no means fully made out even in the most common cases. Thus in the development of language in the child, it is evident that he passes through a period of wholly unintelligent production of sounds. These become gradually more refined in modulation and more elaborate in combination. Finally, imitation of others arises, there is some association of sensory experiences, and of ideas with the sounds produced, until at last the joint mastery of articulation and ideation give rise to fully developed language consciousness. While the broad outline of development of language can thus be given, it is evident to every teacher and observing adult that there are many devious experiences of the individual child in learning particular words which are not adequately described by such a general outline as that given. If individual development is not fully described, much less is racial development, and still less the gradual development of the power of communication in the animal kingdom.

The foregoing illustration serves to suggest a variety of educational problems which are also problems of genetic psychology, the development of the idea of number, the development of the ability to recognize clearly form and

color, the development of the ability to write. These problems are being vigorously attacked by a large number of students at the present time and are among the most promising lines of psychological research.

Some of the more technical problems of genetic psychology relate to the animal intelligence. How rapidly do various species of animals learn new forms of adjustment? Thus, how many trials are required in order to teach a starfish an unusual method of righting itself when it is turned on its back, or how long does it take a white rat to learn a maze? Such inquiries not only throw indirect light on human mental life, but they also promise to furnish a basis on which to build up a complete theory of consciousness in general. See CHILD STUDY.

GENEVA, n. *jĕ-nē′vă* [F. *genièvre*, the juniper-tree: OF. *genèvre*—from L. *junĭpĕrus*]: gin; a spirit distilled from grain or malt and juniper-berries, now often flavored with oil of turpentine—GIN is said to be a contr. for *Geneva;* the name of a town in Switzerland. GENE′VAN, a. of or pertaining to Geneva. GENE′VANISM, term applied to Calvinism, from the fact that its founder so long lived in Geneva. GENEVESE, n. *jĕn′ĕ-vēz*, the people of Geneva. GENEVA CROSS, red Greek cross on a white crown, the emblem of the Red Cross Society (q.v.): see GENEVA CONVENTION. GENEVA-GOWN, the ordinary preaching-gown worn by Presbyterian ministers, usually in Britain, and sometimes in the United States, and by some 'Low Church' Episcopal clergymen. It is of black silk, and in shape resembles the gown of a Cambridge D.D. It was adopted by the followers of Calvin, and by the reformers who took refuge in Geneva, as a protest against the use of the alb, which is essentially a sacrificial vestment.

GENE′VA: city in N. Y., delightfully situated at the n.w. extremity of Seneca Lake 200 m. w. of Albany, 50 m. s.e. of Rochester. It is handsomely built, and commands a magnificent view of the lake and the surrounding country, and is noted for charming residences and extensive nurseries. It is the seat of Hobart College (Prot. Episc.), chartered in 1825. The State Agricultural Export station is also here. The city has an excellent school system, and owns and operates the water-works. G. was chartered as a city in 1898, and is governed by a mayor, and an unicameral council. Pop. (1910) 12,446.

Hobart College now includes the William Smith College, a co-ordinate school for women, and its fine observatory.

GENEVA: canton of Switzerland, in the s.w. of that country; bounded on the n. by the canton of Vaud and the Lake of Geneva, and on the s., e., and w. by the territories of France; 109 sq. m.; watered by the Rhone and the Arne, which unite about two m. from the s.w. extremity of the Lake of Geneva. The surface is hilly, and the soil, not naturally fertile, has been rendered so by the industry of the inhabitants. The political affairs of the canton and city have undergone various changes, the last being a revolution 1847, when the old aristocratic party

was overthrown, and a democratic and progressive party attained to power. Long inert, and in a backward condition, the administration is now most active in developing the resources of the canton. According to the constitution of 1847, all male citizens of 21 years of age exercise the right of electing representatives to the cantonal council; the age of members of which must be at least 25 years. There is a representative for every 666 inhabitants. The executive is composed of a council of state composed of 7 members, nominated for 10 years, and eligible for re-election. The constitution guarantees civil and religious liberty, all forms of worship being allowed by law; but the majority of the citizens pertain to the Reformed Calvinistic Church. The chief branches of industry are agriculture, and the manufacture of articles of *bijouterie* and watches. About 200,000 watches are made annually, and exported to France, England, Italy, and elsewhere. Musical-boxes, chronometers, mathematical instruments, etc., also are made. The chief town is Geneva (q.v.). Pop. of canton about 140,000.

GENEVA (Fr. *Genève*, Ger. *Genf*, Ital. *Ginevra*): most populous and flourishing town of Switzerland, cap. of the canton of Geneva, on the s. extremity of the Lake of Geneva, 70 m. n.e. from Lyon, in France. At the time of the contests between the Helvetii and the Romans, Geneva belonged to the country of the Allobroges. It was afterward included in the Roman *Provincia Maxima Sequanorum*, and was a place of some importance under the Burgundian kings. On the dissolution of the kingdom of Burgundy, Geneva fell under the dominion of the Ostrogoths; in 536, under that of the Franks; and toward the end of the 9th c., under the new kingdom of Burgundy. It had been made a bishop's seat in the 5th c., and from the 12th c. continual feuds arose between the bishops and the Counts of Savoy with regard to the supremacy. The citizens took advantage of these dissensions to obtain fresh liberties and privileges for themselves. In 1518, the Genevese concluded an alliance with Freiburg, and shortly afterward with Bern; thus Geneva became a member of the Swiss confederation.

The doctrines of the Reformation, boldly and enthusiastically preached by William Farel, met general acceptance in Geneva. In conjunction with Bern, the citizens expelled the adherents of the Dukes of Savoy—the so-called Mamelukes—from the town, and declared the bishopric vacant. In 1535, Aug., the Reformed religion was established by law; and 1541, Calvin was invited to take up his residence permanently in Geneva, as public teacher of theology. It was he who chiefly impressed the stamp of rigid morality, not unalloyed with pedantry, on the minds of the citizens of Geneva, and awakened a taste for the exact sciences. The town, previously merely a place of trade, thus acquired an important influence over the spiritual life of Europe, and became the centre of education for the Prot. youth of Great Britain, France,

Germany and Spain. In 1602, the last attempt of the Dukes of Savoy to recover the town was frustrated by the energy and resolution of the citizens. During the 18th c., Geneva was distracted by a continued feud between the aristocratic and popular parties, until in 1782, Bern, Sardinia, and, in particular, France, interfered in aid of the aristocracy. The French Revolution led to a new crisis; the govt. was overthrown 1794, July; equality in the eye of the law was established, a national convention appointed, and a reign of terror commenced. In 1798, Geneva and its territory was annexed to France, under the name of the dept. 'Du Leman.' After the overthrow of Napoleon, Geneva recovered its independence, and the Congress of Vienna increased its territory considerably.

The situation of the town on both sides of the lake where it is narrowed and forms the Rhone, is exceedingly pleasant and advantageous for traffic. Formerly Geneva was surrounded by walls, and consisted of clusters of narrow and ill-drained streets; but since the accession of the democratic party to power 1847 (see GENEVA—canton), an extraordinary change has been effected, chiefly through the energy and enlightened views of M. James Fazy, a wealthy native proprietor. The ancient ramparts have been removed, streets widened and well paved, new and commodious quays constructed along the shores of the lake and river, and a spirit of improvement introduced which points to a great extension of the city. Among the latest improvements is the construction of a breakwater, within which, as in a harbor, steamboats are received and lie in safety, and from which they depart several times daily to the principal ports on both sides of the lake. The two divisions of the town are connected by several fine bridges, of which the Pont du Mont Blanc is the most important. The Rhone parts the city into two branches, forming two islands, on one of which still stands an antique and picturesque cluster of buildings; on the other island, laid out as a public pleasure-ground, there is a statue of Jean Jacques Rousseau, native of the town. Stretching along a part of the new quay, on the left side of the Rhone, there is now a public promenade laid out as a *jardin Anglais*. As forming a central terminus for French and Swiss railways Geneva is a favorite resort of travellers, for whose accommodation there are several large and splendid hotels, commanding fine views of the lake and mountain scenery in the environs. The language spoken is French. The principal edifices are the cathedral church of St. Pierre, which dates from 1124; the town-hall; the college founded by Calvin 1558, with a library of 75,000 vols., the magnificent theatre, opened 1879; the Musée Rath; the observatory; and the museum of natural history, containing De Saussure's geological collection, Haller's herbarium, the fossil plants of Brogniart and Decandolle, etc. The *Académie* (established 1368, reorganized by Calvin and Beza 1539) was raised

1875 to the rank of a university by the addition of a medical faculty. Among many handsome new public buildings are the post-office, a Rom. Cath. and an English church, the last accommodating the large number of English residents and casual visitors. The staple manufactures of the town are watches, musical-boxes, and jewelry: and for the sale of these and other fancy articles, there are many attractive shops. Altogether Geneva is to be considered as one of the most prosperous towns on the continent. Pop. about 110,000.

GENEVA, Lake of, or the Leman Lake (*Lacus Lemanus*): between Switzerland, to which its larger portion belongs, and the recently acquired territories of France. It lies 1,150 ft. above the sea, and extends more than 50 m. from e. to w. in the form of a crescent; greatest breadth eight m.; depth between Evian and Ouchy 920 ft. This lake at some periods of the year presents a curious phenomenon, not yet sufficiently accounted for—the surface, especially near Geneva, rising and falling from two to five ft. in the course of about 25 minutes. The lake, never entirely frozen over, abounds in fish, and several steamers ply upon its waters. The shore on the side of the Pays de Vaud is celebrated for beauty of scenery; the French shore rises solemn and stern, with the mountains of Savoy in the background. From the Lake of Geneva Mont Blanc is visible, and though 60 m. distant, is often reflected in its waters. The Rhone enters the lake at the upper end, turbid and yellow, and leaves it at the town of Geneva as clear as glass, and of deep blue tint. The lake receives about 20 unimportant streams from its shore.

GENE'VA ARBITRATION: action taken at Geneva, Switzerland, 1871, by five arbitrators, under provisions of the treaty of Washington between the United States and Great Britain, for the settlement of various claims of the United States and its citizens against the govt. of Great Britian for losses and damages growing out of the civil war, and historically grouped as 'the Alabama claims.' A diplomatic correspondence had been in progress between the two governments since the early part of the war, the United States at first protesting against the fitting out of armed vessels for the Confederacy in British ports, and afterward asserting claims for damages inflicted by such vessels on its merchant-marine. The first practical step toward adjusting the international disputes—for by this time each govt. disputed the claims and constructions of responsibility of the other—was taken 1869, Jan. 14, when Reverdy Johnson, U. S. minister to Great Britain, and Lord Clarendon, British sec. for foreign affairs, signed a convention in London which provided that all claims upon the part of individuals, citizens of the United States, against the govt. of her Britannic majesty, and all claims on the part of individuals, subjects of her Britannic majesty, against the govt. of the United States, arising since 1853, Feb. 8, should be referred to commissioners for set-

tlement. Public opinion in both countries appeared friendly to negotiation, and it was hoped that this treaty would result in a permanent settlement of all matters at issue. But when the treaty went to the U. S. senate for ratification it received but one favorable vote. Early in 1871, Jan., Hamilton Fish, U. S. sec. of state, renewed the correspondence with Sir Edward Thornton, British minister to the United States, with a view to securing a further conference; and the appointment of the joint high commission and its negotiation of the treaty of Washington, May 8, resulted. The first articles of this treaty provided that five arbitrators should be appointed, one each by the pres. of the United States, her Britannic majesty, the king of Italy, the pres. of the Swiss Confederation, and the emperor of Brazil, who should meet at Geneva, Switzerland, as soon as convenient, and examine and decide all questions that should be laid before them on the part of the govts. of the United States and Great Britain respectively, and make such award as should appear just. The tribunal consisted of Charles Francis Adams (U. S.), Sir Alexander E. Cockburn (Gt. Brit.), Count Edward Sclopis (Italy), Jacob Staempfli (Switz'd), and Viscount d'Itajuba (Brazil). The counsel on the part of the United States were William M. Evarts and Caleb Cushing, and for Great Britain Sir Roundell Palmer. Count Sclopis was chosen pres. of the tribunal. Sep. 14, '72, the tribunal rendered its final decision, holding that Great Britain was responsible for the original fitting out and escape of the *Alabama*, and her subsequent free admission into British ports; was similarly liable in the case of the *Florida;* was liable for captures made by the *Shenandoah* after she was permitted to leave Melbourne; but was not responsible for the acts of the *Georgia, Sumter, Nashville, Tallahassee, Chickamauga*, and *Retribution*. The tribunal overruled the claim of Great Britain that its statute was the only criterion of its power and duty, and the claims of the United States for indirect and national losses, and awarded $15,500,000 as compensation to American private citizens for losses of ships, cargoes, freight, and wages. After the award the U. S. govt. presented a beautiful service of silver to each of the arbitrators.

GENE'VA CONVEN'TION: agreement entered into by the representatives of Switzerland, Baden, Belgium, Denmark, Spain, France, Hesse, Italy, Holland, Portugal, Prussia, and Würtemberg, at Geneva 1864, Aug. 22, for the relief of the wounded in war. The name is applied also to the assembly which adopted the agreement. After the articles of the convention had been signed the govts. signatory thereto formally ratified the act of their representatives. Efforts were then made to secure the adhesion to the convention of all govts. not represented at the first conference, and between 1864 and 81, Greece, Great Britain, Mecklenburg-Schwerin, Turkey, Bavaria, Austria, Persia, Salvador, Montenegro, Servia, Bolivia, Chili, the Argentine Republic, and Peru signed the articles.

GENEVA CONVENTION.

In 1868, Oct., additional articles, chiefly explanatory and particularizing, were proposed and signed at Geneva on behalf of Great Britain, Austria, Baden, Bavaria, Belgium, Denmark, France, Italy, Holland, North Germany, Sweden and Norway, Switzerland, Turkey, and Würtemberg, and were subsequently approved by all the signatory states of the convention of 1864, except the ex-pontifical states. In 1870, July, the Swiss govt. announced that, Rome and Spain excepted, all the original states had accepted the additional articles, that Russia proposed a further supplement with the view of preventing the abuse of the distinguishing flag of neutrality, and that both France and Germany had acceded to the proposal of the federal council of Switzerland to recognize the original and supplementary articles of the convention in the war then in progress between them. During that struggle Red Cross Societies were organized in both countries under the provisions of the Geneva Convention, and the beneficence of the undertaking was indisputably established. It seems strange that the United States govt. should have been the last to give its adherence to the convention, in view of the facts that it had passed through an extraordinary war and that in that war the virtual antetype of the Geneva Convention —the U. S. Sanitary Commission—had rendered incalculable service to the govt., its medical dept., and the sick and wounded soldiers on field and in hospital. The attention of the govt. was called to the Geneva Convention by Clara Barton, who performed field and hospital service during the civil war, assisted the grand-duchess of Baden in the preparation of military hospitals 1870, superintended the supplying of work to the poor of Strassburg 1871, and had charge of the public distribution of supplies to the destitute people of Paris 1872. Unsuccessful in inducing congress to consider the proposition, she organized the American Red Cross Soc. and was elected its president 1881. In his message 1881, Dec., President Arthur favored her proposal. Within a few days all the documents in the state department bearing on the Geneva Convention were transmitted by the president to the senate in response to a resolution, and 1882, Mar. 16, the United States gave its adhesion to this international work of humanity. The uniform and distinctive flag adopted for all hospitals and ambulances, neutralized in accordance with the Geneva Convention, bears a red cross on a white ground and must be displayed beside the national flag. An arm-badge (brassard) with red cross on white field is provided for all individuals neutralized for field and hospital service. Turkey displays the crescent instead of the cross. Beside the Red Cross Societies organized at the outbreak of the Franco-German war, similar ones were in service in the Balkan states during the military operations that preceded and followed the Russo-Turkish war, in the latter war, in Constantinople after the insurrections 1876, and in Alexandria after its bombardment by the British 1882.

RED CROSS SOCIETIES: organizations effected under the provisions of the Geneva Convention for the purposes therein indicated. The delay of the U. S. govt. in becoming a party to the convention was due to the consideration that from the location of the country and the policy of its govt., there was no apparent probability that the nation would be plunged into war. Hence, when the bill authorizing the adhesion of the U. S. govt. to the Geneva Convention was introduced into the senate, it met unlooked-for opposition, till Miss Barton organized the American Red Cross Soc., not exclusively for service in time of war, but to 'provide a system of national relief and apply the same in mitigating suffering caused by war, pestilence, famine, and other calamities.' In the United States these societies are organized much after the plan and on the scope of the town, city, and state auxiliary associations and branches of the former U. S. Sanitary Commission. Through the national soc. they would coöperate with the medical depts. of the army and navy on the field and in the hospital, and supplement the work of the surgeon and physician in nursing, etc., in case of war. Since the American Red Cross Soc. was established its services have often been utilized with great advantage. In 1884 Miss Barton had charge of the expedition for the relief of the sufferers by the flood in the Ohio and Mississippi rivers, and 1888 furnished nurses, specially skilled physicians, and various articles for the relief of the victims of the yellow fever epidemic in Fla. Other notable relief work of this soc. was the distribution of food and clothing during the persecutions in Armenia, 1894–96, and especially that in Cuba prior to, during, and after the war with Spain.

GENEVIEVE, SAINT: 422–512; b. in the village of Nanterre, near Paris: saint of the Rom. Cath. Church, subject of many popular and highly poetical legends, and regarded with special veneration in France and particularly in Paris, of which city she is deemed patroness. From a nearly contemporary life of Saint Genevieve, we learn the facts of her history. As a mere child, she attracted the notice of Germanus of Auxerre, who passed a night at Nanterre on his return from Britain 429. Germanus is said to have marked her out as specially destined to a life of holiness and purity; and the child, partly from her natural tendency, partly, perhaps, under the influence of the counsel of so holy a bishop, devoted herself to a life of virginity and conventual seclusion. On the death of her parents, she was removed to Paris; and her active charity, and the extraordinary reputation for sanctity which she acquired there and in other cities of France, which she visited on missions of Christian benevolence, won for her the admiring veneration, not alone of her own people, but even of the heathen or half-converted tribes, which, about this period, after a long series of struggles had begun to amalgamate with the ancient population of the Roman province of Gaul. During the Frank invasion

under Childeric, Genevieve, with her sisters in religion, set out on an expedition for the relief of the starving city, and successfully conveyed to Paris an abundant supply of provisions. The city, when taken, was treated with special leniency through her intercession with the king, and many captives obtained their liberty at her prayer. On the new alarm for the safety of Paris, created by the tidings of the march of Attila and his army of Huns, it was proposed to abandon the city; but Genevieve, assembling the matrons and consecrated virgins in one of the churches, exhorted them to avert, by prayer and fasting, the threatened calamity. The unexpected alteration of the direction of Attila's march added greatly to her reputation and influence; and it is agreed that her personal example, and that of the sisterhood to which she belonged, appealed, with considerable effect, to the natural sensibilities of the rude races which now found themselves, for the first time, in contact with the humanizing influences of the Christian religion. Saint Genevieve enjoyed, to an extreme age, the reverence and love of the entire people. She died at the age of 89, and her memory is still affectionately described as the type of all that is purest and most elevating in the conventual life, as well as of all that is most admirable in the works of charity and benevolence. Under her patronage, and with her name, a religious congregation of priests was founded in the 12th c., which, with some vicissitudes, continued until the Revolution. A religious congregation of women, under the name of 'Sisters of St. Genevieve,' was established 1636, devoted chiefly to the care of the sick and the education of young females.

GENGA, *jĕn'gâ*, Bartolommeo: architect: 1518–58; b. Cesena, Italy; son of Girolamo Genga. He studied architecture with his father, was appointed intendant of public buildings by the Duke of Urbino, was architect of the Church of San Pietro de Mondovi, and, commissioned to put the island of Malta in a state of defense, traced the plan of Valetta, and designed several churches, but died before the work was completed.

GENGA, Girolamo: 1476–1551; b. Urbino, Italy: architect and painter. He studied art with Perugino and Raphael, with whom he became very intimate, executed the greater part of his work in Siena, Rome, and Urbino, was architect of the ducal palace near Pesaro, restored the archiepiscopal palace at Mantua, and was author of numerous treatises on fine arts. His masterpiece in oil painting was *The Resurrection of Christ* at Siena.

GENGHIS (or Jenghiz, or Tchinggis, or Zingis) KHAN, *jĕn'gĭs-kân*, originally called Temujin, Emperor of Mongolia, and conqueror of a great part of Asia: 1162, Jan. 25—1227, Aug. 18; b. at Deylun-Yeldâk, near the n. bend of the Feramuran (Hoang-Ho); son of Yesukai Bahâdûr, Mongol chief, who ruled over 30 or 40 families or clans, called the tribe of Neyrun, dwelling between the

Amur and the great wall of China, and paying tribute to the Khan of East Tartary. On his father's death he did not hesitate to assume the reins of government, though only 13 years of age. Some of the subject tribes refused to obey him, and chose another chief belonging to the same family. A war through several years was the result, at the termination of which he was compelled to retire to Karakorum, cap. of Toghrul Ungh-Khan, monarch of the Keraeit, and place himself under that monarch's protection. Ungh-Khan gave him his daughter in marriage, and appointed him to the command of his army, in which capacity Genghis Khan gave proof of great military talent, conquering the Mekreit, Tanjût, Jellâeir, and other neighboring tribes. But Ungh-Khan, becoming jealous of his growing reputation, and urged on by envious courtiers, ordered Genghis Khan to be assassinated. The latter, having taken counsel with his relative and chief councilor, Karatchâr Nuyan, a youth of his own age but renowned in Tartar history for his wisdom, resolved to depart for his native country, which, after many hair-breadth escapes, he reached at the head of 5,000 cavalry. Raising an army, he marched against his father-in-law; and Toghrul, vanquished in battle 1203, sought refuge among the Naymans, but was slain by the guards stationed on the frontiers. Genghis Khan immediately seized Toghrul's dominions. In the following year, a number of Tartar tribes, alarmed at his increasing power, formed a powerful league against him. The command was given to Tai-Ungh-Khan, chief of the Naymans; but in a battle on the banks of the Amur, Genghis Khan utterly routed his enemies, slew their leader, and became at once master of almost all Mongolia. Grander views of conquest seem now to have opened before his vision. In 1206 he convoked a kouriltai, or general assembly, on the banks of the Onan, a tributary of the Amur, flowing through his native land. This meeting was attended by deputies from all the subjugated hordes of Tartary, and Genghis Khan contrived to obtain a religious confirmation of his designs. Up to this period, he had borne the name of Temujin; but a renowned magician or priest, surnamed Bout-Tangri ('Son of Heaven'), venerated by all the Mongols, now came forward and pronounced him *Genghis Khan*—i.e., greatest of khans, or khan of khans, declaring that he should rule over the whole earth. The deputies were duly impressed. About this time the Eighurs, an agricultural and civilized people, inhabiting the country at the sources of the Hoang-Ho and Yang-tse-Kiang, voluntarily submitted to his sway. From this people, who professed Buddhism, the Mongols appear to have acquired a knowledge of writing. They adopted the Eighur characters, but preserved their own language; and Genghis Khan selected one of the newly-submitted tribe to instruct his children. The next important incident in his career was the conquest of the n. portion of China, called Khatai. The immediate cause of the war between Genghis Khan and the emperor of China,

Tchong-Héi, was the refusal of the former to recognize the latter as his suzerain, or liege lord. Most of the Tartar tribes which Genghis Khan had subdued were really tributaries of the Chinese empire; and Tchong-Héi, though not interfering to prevent the conquests of the Mongols, now wished Genghis Khan to acknowledge his superiority by paying tribute. Genghis Khan immediately prepared for war, scaled the great wall 1211; and after a series of bloody and protracted campaigns, Pekin fell into the hands of the barbarians 1215. Meanwhile Genghis Khan was called back to Tartary to quell certain insubordinate tribes, headed by Gutchluk, son of the chief of the Naymans, who had recovered his ancestral dominions, and also conquered those of the Gûr-Khan of Kara-Khatai. These tribes were nearly exterminated in a great fight near the sources of the Yenissei. Gutchluk, however, had some time before taken refuge in Turkestân, a vast region stretching from Lake Lob, in the middle of Tartary, westward to the Sea of Aral. Here he succeeded in making himself supreme ruler, but only to be swept away by the victorious Mongols, now pressing westward in an irresistible torrent. At length Genghis Khan reached the Sihoon, n.e. boundary of the empire of Khaurezm or Kharism, whose ruler, Ala-ed-dim Mohammed, was one of the most powerful sovereigns in Asia. The dynasty to which he belonged had risen into power through the weakness of the Seljuk sultans; and its sway extended from the borders of Syria to the river Indus, and from the river Sihon to the Persian Gulf. The murder of some Mongol merchants at Otrâr, a town on the Sihon, afforded Genghis Khan a pretext for invasion. He immediately dispatched his eldest son, Jûjy, at the head (according to Eastern chroniclers) of 700,000 horse, who accordingly burst like a storm into Khaurezm 1219; and after having overthrown the Tartar allies of Sultan Mohammed, and fought a long and bloody battle with the sultan himself with no decisive result, captured Samark, Bokhara (the valuable library of which he destroyed), and all the other important cities of the country. The Mongols, in three separate divisions, now scoured and ravaged Khaurezm in all directions. In the course of five or six years, they overran the whole of Persia, subdued the inhabitants of the Caucasus, crossed into Russia, and plundered the land between the Wolga and the Dnieper. Nor were they less successful in the east; the whole of s. Asia, as far as the Sutlej, experiencing the miseries of their devastations. Sickness, disease, and exhaustion at length enfeebled the Mongol hordes, and compelled Genghis Khan to return to Karakorum, in Tartary, capital of his empire, 1224. During his absence, his generals had been prosecuting the Chinese war with the greatest success. Genghis Khan though well advanced in years, was still possessed by the old thirst of conquest; and having recruited his forces, he led them across the great desert of Gobi to the kingdom of Tanjout,

in the n.w. of China, whose capital Nin-hia, he besieged. Disheartened by the loss of the greater part of his army, the king of Tanjout promised to capitulate at the end of a month; but in the interval Genghis Khan, worn out with years and toils, died, on the hill Liou-pan. He is said to have had 500 wives and concubines, and to have left a great number of children, among three of whom he divided his enormous possessions. The third son, Oughtai, was appointed 'Grand Khan,' and received for his share the country now called Mongolia, with Khatai or N. China as far n. as the mouth of the Amûr. The second son, Tcheghatai, received Turkestân n. of the Amû or Jeyhûn, and was committed to the guardianship of Karatchûr Nuyan. Jûjy, for his share, obtained Keptchâk, and all the country w. and n. of Turkestân, an immense tract extending from the Caspian Sea almost to the Northern Ocean.

In the course of his sanguinary career Genghis Khan is said to have destroyed, by wars and massacres, no fewer than five or six millions of human beings. His conquests were generally accompanied with acts of appalling barbarity, yet we seem to trace through the dreadful history of the man some indications of a civilizing tendency. Himself a Monotheist, a stern believer in God after the fashion of Mohammed, he nevertheless tolerated all religions; exempted from taxes and military service physicians and priests; made obligatory the practice of hospitality; established severe laws against adultery, fornication, theft, homicide, etc.; organized a system of postal communication throughout his enormous dominions (mainly, no doubt, for military purposes); and so thoroughly organized what we may call the police or civil authority, that it was said one might travel without fear or danger from one end of his empire to the other. He would also appear to have had a respect for men of learning and virtue, and to have retained several such about his person. The only memorial of Genghis Khan now known to exist is a granite tablet, with a Mongol inscription (commemorating his conquest of Kara-Khatai), discovered among the ruins of Nertschinsk. See *Life of Jenghiz Khan*, from Chinese sources, by Prof. R. K. Douglas (1877).

GENIAL, a. *jē′nĭ-ăl* [OF. *genial*—from L. *genĭālĭs*, merry, pleasant: It. *geniale*]: cheering; enlivening; contributing to life and cheerfulness; pleasantly warm and cheering, as genial weather. GE′NIALLY, ad. *-lĭ*. GENIAL′ITY, n. *-ĭ-tĭ*, gayety; cheerfulness.

GENICULATE, v. *jĕn-ik′ū-lāt* [L. *genĭcŭlātŭs*, having knots, jointed—from *gĕnū*, the knee]: in *OE.*, to form joints or knots on: ADJ. in *bot.*, bent like a knee. GENIC′ULATING, imp. GENIC′ULATED, pp.: ADJ. having joints like the knee. GENIC′ULA′TION, n. *lā′shŭn*, the state of having knots or joints like the knee. GENICULATE GANGLION, in *anat.*, a gangliform enlargement on the facial nerve.

GENII, n. plu. *jē′nĭ-ī* [called by Eastern nations *ginn* or *djinn* (see GENIUS)]: race of imaginary beings in Eastern tales, said to have been created from fire, and endowed with certain bodily forms which they can change at pleasure, and to have possessed superhuman powers. According to the belief of the old Italian races, genii were protecting spirits, who accompanied every created thing from its origin to its final decay, like a second and spiritual self. They were appropriated not only to men, but to all things animate and inanimate, and especially to places. They were regarded as effluences of the Divinity, and were therefore worshipped with divine honors; sacrifices were annually made to them on various occasions, especially on birthdays, and during the period of harvest. Indeed, Jupiter himself was called the genius of men, and Juno of women. Not only had every individual his genius, but likewise the whole people. The statue of the national genius was placed in the vicinity of the Roman forum, and is often seen on the coins of Hadrian and Trajan. The genius of an individual was represented by the Romans as a figure in a toga, having the head veiled and the cornucopia or patera in the hands; while local genii appear under the figure of serpents eating fruit set before them. (Compare Hartung *Die Relig. der Röm.* 1. p. 32, etc., and Schömann *De Diis Manibus, Laribus, et Geniis*, Greifswald, 1840.)—The GENII of the East bear no resemblance to the old Italian genii. Their proper Arabic name is *Djinn* or *Jinn;* and there seems to have been no better reason for translating the word by the Latin term *genius*, than the casual similarity of the sounds. The word Djinn is from an Arabic root, signifying 'to veil' or 'conceal,' and properly denotes an 'invisible being.' The djinns, or Eastern genii, are, in fact, regarded by the Arabs and Persians as an intermediate class of beings between angels and men, inferior in dignity to both. They are described in poetry as the subjects of a certain Ján Ibn Ján, and as inhabiting the world before the present race of human beings; but they having excited the anger of God by their rebellion, he sent his favorite angel, Hháris, or according to others, Azazel, to punish and govern them. Some time afterward Hháris himself rebelled, whereupon God condemned him to eternal punishment. From this period, on account of his despair or his apostasy, he was called Eblis or Iblis. It is believed that the djinns can assume, in an instant, any form that they please, whether of man, brute, or monster, the last—in accordance with the popular view of their wicked character—being the one most frequently selected. Such as have read the *Arabian Nights* will have a vivid recollection of the hideous and gigantic shapes under which the genii are wont to manifest themselves, accompanied at times with smoke and thunderings, to terror-stricken mortals. They are in no degree whatever *guardian* spirits like the genii of the old Italians; on the contrary, they are inimical to man's happiness, and can

be subdued only by the spells of powerful magicians: see FAMILIAR SPIRITS. The better-informed Easterns, however, do not believe, it is said, in the actual existence of such beings. The Mussulman doctors, it is true, affirm the existence of djinns as an invisible race of supernatural beings, who carry out the purposes of Deity, but they reject altogether the grotesque and repulsive inventions of the Arab and Persian romancers and poets.

GENIPAP, *jĕn′ĭ-păp:* much esteemed fruit of the W. Indies and warm parts of S. America. The tree which yields it is *Genipa Americana*, of nat. ord. *Cinchonaceæ*. It is a 2-celled berry, containing many seeds; about as large as an orange, of a whitish-green color, with a dark purple juice of agreeable vinous taste.

GENISTA, *jĕ-nĭs′ta:* genus of leguminous plants, for whose characters, see BROOM. Some of the species are popularly known by the name Broom, some as GREENWEED (q.v.). *G. Anglica*, much branched, very spiny shrub, not above 12 inches high, is called PETTY WHIN and NEEDLE FURZE in England, where it is regarded as indicating a very poor soil. The G. of Virgil and other Roman classics is supposed to be *G. Hispanica*, native of the s. of Europe, with branched stiff spines. *Gen* is said to be a Celtic word, signifying a shrub. The name Plantagenet is from *Planta Genista;* but what plant was intended, and whether the common furze or a species of genista is not certain.

GENITAL, a. *jĕn′ĭ-tăl* [F. *génital*—from L. *genĭtālĭs*, serving to beget—from *gigno*, I beget: It. *genitale*]: pertaining to generation or the act of begetting. GEN′-ITALS, n. plu. *-tălz*, in *animals*, the organs of generation.

GENITIVE, n. *jĕn′ĭ-tĭv* [F. *génitif*, the genitive case—from L. *genĭtīvŭs*, pertaining to generation or birth, genitive case—from *gigno*, I beget: It. *genitivo*]; in *grammar*, name of one of the 'cases' (see DECLENSION); applied to a noun or other word inflected to indicate possession. GENITIVE, a. pertaining to source, origin, or possession; possessive.—*Genitive case in Grammar.* In such an expression as (Lat.) *regis filius*, (Eng.) the *king's son*, the form *regis* or *king's* is called the genitive case; and according to the usual explanation, this name was given to it because it indicates the source or origin of the thing joined with it. But a more satisfactory account of the origin of the name, and of the real nature of the genitive case, is given by Max Müller (*Science of Language*, I. 121). The terms of grammar were originally applied, not to the parts of speech, but to the elements of thought; they were logical terms before they were grammatical. Long before the now familiar grammatical distinctions of singular and plural, of gender, case, voice, etc., had been thought of, the Greek writers on dialectics, in analyzing the different parts of an expressed thought, had distinguished the principal notion—the subject or nominative as it is called—from secondary or dependent notions; the dependency of the latter they expressed by the word

ptosis (Lat. *casus*), a fall or leaning of one thing upon another; and in such a proposition as, 'the king's son is dead,' they indicated the exact nature of the dependence by calling it the *genikē ptosis*, i.e., the case showing the genus, kind, or class—the generic case; for while the name 'son' is applicable to every man having parents, 'king's son' is limited to the class of sons having kings for their fathers. One name joined to another in this relation has thus the same effect as an adjective (q.v.) in limiting its application. It seems probable, indeed, that the termination of what we now call the genitive case, was originally the same as that by which adjectives were formed from nouns. The names thus applied to ideas were by the Greek grammarians of Alexandria transferred to the words expressing them, and were afterward translated into their Latin equivalents by the Greek grammarians who taught their language to the youth of Rome. But by this time the terms had become strictly technical, and their original signification little thought of; and this may account for the Greek *genike*, the Latin equivalent for which is *generalis*, being rendered erroneously by *genitivus*, generating or producing, which would have been expressed in Greek by *gennetikē*.

In English, the genitive is the only case or relation among nouns expressed by a difference of termination, and even it is often expressed by the preposition *of;* as the *river's* brink, or the *brink of the river*. From the frequency with which the form in *'s* indicates that one thing belongs to another, it is often called the *possessive* case. But this name is little applicable in such expressions as a *day's* journey; still less in many cases where the genitive is used in the ancient languages; e.g., *fons lactis*, a fountain of milk. The *generic case*, however, meaning that which limits the other noun to a class or kind, will be found to express the real relation in every conceivable combination.

The termination *'s* has been erroneously supposed to be a contraction for *his*, as if 'the king's son'='the king his son.' But this might not account for 'the queen's son,' or for 'men's sons.' Besides, *his* itself is the genitive of he, and formed in the same way as king's, for the apostrophe (') is a mere artificial expedient of writing to distinguish the possessive from the plural, and does not belong to the spoken language. The English genitive in *'s* is a genuine relic of the inflections (q.v.) common at an early stage to all the Aryan languages. The prevalent ending of the genitive singular in the Anglo-Saxon was *s*, and in modern English it has been extended by analogy to all nouns and even to the plural. When the plural ends in *s*, the additional *s* of the genitive is omitted, for the sake of the sound, as kings' sons.

GENIUS, n. *jē'nĭ-ŭs* [L. *gĕnĭŭs*, the good or evil spirit supposed to attend on a man or woman, taste, inclination: It. *genio:* F. *génie*]: supposed protecting or ruling power of men or places; an imaginary spirit (plu. Genii): *jēn'-*

yŭs, the natural bent or disposition of mind by which a person is qualified for some particular employment; high mental powers or faculties; a person possessed of uncommon intellectual faculties: peculiar character, as 'genius of the place.' GEN'IUSES, n. plu. *-yŭs-ĕz* (see GENIUS, below). GENII, n. plu. *jē'nĭ-ī*, good or evil spirits presiding over men's destiny in life; imaginary spirits (see GENII, above). GENIUS-LOCI, *-lō'sī*, the presiding or tutelary deity of a place; hence, the pervading spirit of a place or institution.—SYN. of 'genius': ability; skill; capacity; capability; cleverness; talent.

GENIUS: extraordinary mental ability, especially of a creative nature. Whether any distinction other than one of degree can be drawn between genius and talent is doubtful. It seems most probable that, just as moderate ability shades off by imperceptible degrees into great ability, so the latter merges by degrees into genius. Genius combines great intellectual power, especially of the 'productive imagination,' with great attraction for some kind of productivity. If there be any difference in kind between genius and great talent, it is probably found in the tendency of genius to become so absorbed in a favorite mental activity as to be almost in a state of somnambulism; a related fact is that noted by Galton in the words, 'the powers of unconscious work possessed by the brain are abnormally developed in them.' A certain relation between genius and insanity has been suspected ever since Greek times, and has found frequent expression in literature and popular proverbs. Many geniuses have been at least eccentric, while a rather surprising number have been insane at some period of their lives; some, again, have suffered from nervous diseases, especially epilepsy and neurasthenia. The surprising view that genius was a type of mental disease or degeneration was advanced by Moreau de Tours, and more recently Lombroso has sought to show that genius is really a form of epilepsy. The lives and works of great writers, musicians and others have been scrutinized for evidences of mental instability; and not a few have indeed been found; yet the present judgment of scientific critics is that this line of argument has been greatly overdone. To reach a reliable conclusion as to the possible connection between genius and nervous instability, we should need to know the statistical frequency of the occurrence of neurotic traits among great men, and also the frequency of the occurrence of such traits among common men; and neither is known, even approximately.

The relation between great mental ability and size of brain has aroused the interest of anthropologists; some great men have had brains of extraordinary size; but so many others have not been especially developed in this particular that the connection between brain-size and mental ability is not thought to be close. The question of the inheritance of great ability has been attacked by Galton in a statistical way, and the conclusion reached

that genius is, at least to a large degree, a matter of heredity. It runs in families, or at least eminent talent runs in families. Galton has shown that geniuses occur in a fairly constant relation to the size of the population, so that they may be viewed as the outlying members of a serially arranged group, at one end of which the genius is found, and at the other end the commonplace, average person. Between the rare genius and the numerous commonplace men, occur the men of talent. That a man of genius must necessarily be puny and unhealthy—all brain and no muscle—is a popular but an entirely unwarranted belief; some, even many, have been, but the reverse is rather the rule. Consult Galton, *Hereditary Genius* (London 1892); Nordau, *Degeneration* (New York 1895); Lombroso, *The Man of Genius* (New York 1891); Baldwin, *Mental Development* (New York 1897).

GĖNIZAH: a place of concealment, applied to a storeroom or place of hiding in synagogue or burial-place for old Hebrew books or MSS., no longer in use or for various reasons not permitted circulation. While there are scattered references in the Talmud to a genizah either for preservation or concealment, in the Middle Ages, such store-rooms were used for Hebrew MSS. or papers which contained the name of the Almighty, and hence should be preserved from profanation, as well as for articles connected with the synagogue ritual. The word has more recently come into notice owing to the discovery made by Dr. S. Schechter, on May 13th, 1896, of a fragment of the original Hebrew of Ecclesiasticus in the Cairo Genizah. It had been visited by travelers and scholars, but after the old synagogue of Fostat, near Cairo, a church until 616, was renovated, the genizah come to light and some of its contents thrown out, many of which were acquired by collectors and scholars. The identification of a fragment which had thus been obtained, as a Ben Sira text, by Dr. Schechter in May, 1896, induced him to go to Cairo and return with precious material from the genizah, which forms now the bulk of the Taylor-Schechter collection at the Cambridge university library. Besides, Mr. E. A. Adler, of London, Archduke Rainer, of Vienna, and Messrs. Lewis and Gibson, (who had made discoveries of MSS. in the Mt. Sinai Monastery), visited Cairo and brought back many fragments from the genizah, their example being followed later by many others in Europe and the United States. Mr. E. A. Adler, who has made extended journeys among the Jews of the East (*Jews in Many Lands*, Philadelphia), shows the universality of the practice among the ancient synagogues; in some the genizah is an alcove in the ground floor at the back of the ark (q.v.), in another, it is in the roof, in some it is in the underground cellar. The contents are often periodically removed to the cemetery—the graveyard being the repository of valuable material, some of which is now gradually being removed.

GENLIS, *zhŏng-lēs'* STÉPHANIE FÉLICITÉ, Comtesse de: 1746, Jar. 25—1830, Dec. 31; b. Champcéri, near Autun, Burgundy; of an ancient but reduced family named Ducrest. At the age of 15 she was married to the Comte de Genlis (who afterward became Marquis of Sillery, and perished on the scaffold, 1793, in the Revolution), and in 1770, through the influence of her aunt, Madame de Montesson (who had been privately married to the Duc d'Orleans), was made a lady-in-waiting in the household of the Duchesse de Chartres. Here she soon became known for wit and brightness. In 1782, the Duc de Chartres, afterward known as Egalité, appointed her 'governor' of his children. This appointment gave rise to certain scandalous reports, the truth of which various circumstances subsequently transpiring, have been deemed to confirm. In this year she was separated from her husband. Madame de Genlis wrote a variety of works for her puplis, among others, *Théâtre à l'usage des jeunes personnes, ou Théâtre d'Education* (Paris, 1779-80); *Adèle et Théodore, ou Lettres sur l'Education* (1782); and *Les Veillées du Château, ou Cours de Morale, à l'usage des Enfants.* On the breaking out of the Revolution, Madame de Genlis took the liberal side, but was ultimately compelled to seek refuge in Belgium. Afterward she went to Switzerland, and in the same year to Altona, in Germany, where she wrote a romance, entitled *Les Chevaliers du Cygne, ou la Cour de Charlemagne;* and also *Précis de la Conduite de Madame de Genlis pendant la Révolution,* as a sort of reply to the accusations of her numerous enemies. When Bonaparte became consul, she returned to Paris, and received from him a pension. From this time she resided constantly in Paris, publishing in rapid succession one book after another till her death. Madame de Genlis's writings amount to about 90 vols., chiefly descriptions of incidents in fashionable society, with which she was thoroughly acquainted, and which she painted in lively colors. As she advanced in life, her writings became more and more polemical and ill-natured. Her *Observations Critiques pour servir à l'Histoire littéraire du* 19^{me} *siècle* (2 vols. Paris 1818); and her *Dictionnaire Critique et raisonné des Etiquettes de la Cour, des usages du Monde,* etc.; and her *Dîners du Baron d'Holbach,* subjected her to severe criticism. The last of these contains much curious but malicious information concerning the freethinkers of the 18th c. Nevertheless, her writings have been very popular, and have passed through several editions. Her voluminous *Mémoires* were written after she had reached her 80th year.

GENNADIUS, *jĕn-nā'dĭ-ŭs* (GEORGIUS SCHOLARI or SCHOLARIUS), Patriarch of Constantinople: a learned Greek: date of birth and death unknown. He participated in the great council of Ferrara (1431), later at Florence (see FERRARA, COUNCIL OF: FLORENCE, COUNCIL OF), exerted himself to bring about a union of the Greek and Latin churches, and drew up a plan for unic ' so vague and am-

biguous that it might have been accepted by both parties without binding either to extreme or inconvenient concessions. His chief opponent in the council was the Platonist, George Pletho Gemistus, the most vigorous worker against the then dominant Aristotelianism, who strongly maintained the principles of the Greek Church. After the council had been removed to Florence, Pletho published a work exhibiting the difference between Aristotle and Plato, to which Gennadius replied. After the capture of Constantinople by the Turks, Mahomet chose Gennadius, then described as a layman, to fill the vacant patriarchal chair, 1453, and while holding the episcopal office Gennadius drew up a confession of faith, regarded as the earliest expression of the principles of the Greek Church; and he condemned to the flames Pletho's treatise on *Laws*. It is believed that he soon resigned the episcopal chair and spent the remainder of his life in a convent.

GENNES, *zhĕnn*, JULIEN, Count de: 1652-1704; b. Vitrè, France: navigator. He entered the French navy at an early age, and for eminent services was promoted capt., and appointed chevalier of the Order of St. Louis 1677. In 1695 he sailed from La Rochelle in command of an expedition of 6 vessels placed at his disposal by the king. He entered the Straits of Magellan 1696, Feb., and after rounding Cape Forward discovered and named French Bay, and called a river emptying into it after himself. He founded a colony there, returned to France, and was appointed gov. of the part of the Island of St. Christopher under French jurisdiction. With a force of 160 men he defended his dist. against a body of 2,000 Englishmen till forced to surrender, 1702, July 16. Charges were preferred to the king against him, and while awaiting a decision on his reports he was captured by a Dutch cruiser, taken to Martinique, and there tried, declared guilty of cowardice, and deprived of all his honors. While on the way to France to appeal to the king in person, he was captured by the English and taken to Plymouth, where he died. On learning the facts the king pensioned his widow and children and restored his titles to the family.

GENNESARET, *gĕn-nĕs'a-rĕt* or *jĕn-nĕs'a-rĕt*, SEA OF: called also in the New Testament, *The Sea of Galilee*, and *The Sea of Tiberias* (from the city of Tiberias), and in the Old Testament *The Sea of Chinnereth* or *Cinneroth*, from an ancient town of that name on or near its shores: lake in n. Palestine. The word Gennesaret is supposed by some to be merely a corruption of Chinnereth; but others derive it from *Gannah*, a 'garden,' and *Sharon*, the name of a plain, between Mount Tabor and the lake. The lake is about 13 m. long, and 6 broad, in the bottom of a great basin, undoubtedly of volcanic origin. Although the Jordan runs into it red and turpid from the n., and many warm and brackish springs also find their way thither, its waters are cool, clear, and sweet. Its shores are enlivened with sparkling pebbles. Now, as formerly, it abounds in fish; but

the fisheries are almost entirely neglected. The surrounding scenery is not very beautiful, but its associations are among the most sacred in Palestine. 'Like Jerusalem, the Sea of Gennesaret is enshrined in the heart from childhood. The home of Christ—'His own city'—Capernaum, lay on its shores; many of His miracles were performed around and upon it; He taught the multitudes that followed Him, on the heights over it, along its pebbly beach, and from a boat on its surface; most of the apostles were fishermen, who here gained their daily bread; and one of Christ's last earthly interviews with them, after the crucifixion, was on that occasion when, driven probably by necessity, they had temporarily resumed their old occupation, and had toiled a long night without success' (Porter, *Hand book for Syria and Palestine*, Part ii, 418). In the time of Christ, the region of the lake was the most densely populated in Galilee. Nine cities and towns stood on the shores of the lake, while the neighboring plains and eminences were dotted with numerous large villages. Of the nine cities, seven are now uninhabitated ruins; half-a-dozen mud-hovels are sufficient to house all the human life at Magdala, and only Tiberias shows some feeble traces of its former prosperity.

GENNET: for GENET, a Spanish horse.

GENOA, *jĕn'o-a:* province of Italy, in Liguria, bounded on the s. by the Gulf of Genoa.; 1,588 sq. m. It is divided into four districts, has in general a rough surface with little cultivable soil, yields large quantities of grapes, olives, and fruits, and has considerable silver, copper, lead, manganese, and slate interests. It is drained by a number of short rivers rising in the Apennines, comprises some of the most picturesque portions of the kingdom, and has its gulf coast skirted with a great highway, the Cornice road, and a railroad. Cap. Genoa. Pop. about 950,000.

GENOA, *jĕn'o-a* [Ital. *Genova;* Fr. *Gênes;* anc. *Genua*]: city of Italy, on the Mediterranean Gulf of Genoa, at the foot of the Apennines, 79 m. s.e. of Turin; capital of a province, and a very important seaport; lat. of light-house, 44° 24′ 18″ n., long. 8° 54′ 24″ e. Pop. about 250,000. From the sea the aspect of Genoa is a splendid panorama; the slopes of the hills down to the shore are covered with palaces, churches, hotels, and private dwellings, relieved by terraced gardens and groves of orange and pomegranate trees; while the bleak summits of the loftier ranges are capped with forts, batteries, and outworks, which constitute a line of fortification of great strength and extensive circuit. The old harbor, of which the diameter is rather less than a mile, is semicircular, and formed by two piers, at the extremity of one of which stands a light-house tower, 300 ft. high. From 1877-95 very large additions were made to the harbor. The mole was extended and a new breakwater added, creating a new harbor and an outer basin for war vessels. Around the harbors stretch 5 miles of fine docks. Nearly 15,000 vessels enter and clear the port of Genoa, yearly. It is the terminus of

several important Transatlantic lines, and a port of call for steamers to the Far East. There is railway communication between Genoa and Turin, Arona, Alessandria, Nice, Venice, Florence, Rome and Naples, as well as the great cities of Europe. The Simplon Railway reaches the Mediterranean here. Several important establishments are grouped around the port—viz., the arsenal, the convict prison, the custom-house, and the *Porto Franco* or free-port warehouses, where merchandise may be stored previous to its re-exportation free of duty. Genoa is the great commercial dépôt of a wide extent of country, of which the chief raw exports are olive oil, rice, fruits, cheese, steel, etc.; the manufactured goods exported are velvets, silks, damask, gloves, flowers, paper, soap, jewelry in silver and coral, in all of which industrial branches the excellence of the Genoese workmen is incontestable. The imports are principally cottons, raw cotton, woolens, cochineal, indigo, grain, hides, etc. The annual exports of Genoa are valued at abt. $80,000,000; imports at abt. $100,000,000.

While strikingly grand as viewed from the sea, and so far worthy of being entitled *La Superba*, a closer examination of Genoa tends materially to lower its character for beauty and magnificence. Hemmed within walls, and built awkwardly on irregular rising grounds, it has never been subjected to any comprehensive plan of improvement, and remains very much a labyrinth of narrow and intricate lanes, accessible only to foot-passengers, or to the pack-mules by use of which a large portion of the internal goods traffic is conducted. These thoroughfares into which the light of day imperfectly penetrates, are lined with tall buildings, some of marble and of handsome architecture, but with difficulty seen from the limit of the space in front; and all their grandeur fails of effect. Many of them—former residences of merchant-princes—are transformed into hotels or business establishments; in some the superb lobbies, environed by marble columns, are occupied by petty traders, and shabby in the extreme. Only a few streets are wide enough for carriages, and in these the aspect is more like that of modern cities. Several *palazzos* still belong to persons of distinction who have the means of maintaining them in their original splendor, or they are appropriated as public buildings. The two most famous are the Palazzo Ducale, formerly inhabited by the doges, now appropriated to the meetings of the senate; and the Palazzo Doria, presented, 1522, to the great Genoese citizen Andrea Doria, whose residence it was during his presidency of the republic. The palaces Brignole Sale, Serra, Reale, Pallavicini, Spinola Balbi, Negroni, and many others, possess great interest both for historical fame and architectural beauty. Many contain galleries of paintings, which are shown for a fee. Some of the churches are particularly fine; the most noticeable being the cathedral of St. Lorenzo, a grand old pile in the Italian Gothic style. Genoa con-

tains many excellent public institutions, almost all dating from the period of the republic. The great hospital, and the asylum for the poor (*Albergo de' Poveri*), are especially worthy of mention. The latter makes provision for 1,600 persons, orphans and old people: the orphans are trained up to useful employments, and such girls as marry out of the hospital receive a small dowry. The deaf and dumb institution, and the hospital for the insane, are the best in Italy in extent and regulation. There are numerous excellent foundations called *conservatorie*, devoted to various philanthropic purposes, the chief of which is called the Fieschine, an asylum for female orphans. The public library contains 50,000 vols., and is unrestrictedly open to the public. The Acad. of Fine Arts was founded by the Doria family. The theatres of Genoa are very fine, that of Carlo Felice ranks among the best in Italy.

The Genoese are a shrewd, active, laborious class, with all the qualities of a commercial and maritime community. They make skilful and hardy seamen, energetic traders, and thrifty husbandmen, and are still remarkable for the spirit of enterprise and freedom which so strongly characterized the period of the republic. Claiming Columbus as a native of their city, they have recently erected a handsome public monument in honor of that distinguished navigator. While the main business of the town is evidently maritime, there is also an extensive trade in the manufacture and sale of a peculiar kind of jewelry. This consists of remarkably fine filigree-work in silver and silver gilt, which resembles that of India, and is equal in intrinsic value. Few of the many tourists who pass through Genoa fail to purchase one or more of these pretty and cheap articles of bijouterie.

History.—The early history of Genoa and of its ancient inhabitants is observed with fabulous traditions. The Ligurian tribes, who held possession of Genoa previous to its incorporation with ancient Rome, are of disputed origin. By some historians, they are classed with the Celtic race, while others deem them of Greek extraction. Genoa is mentioned in history first during the Second Punic War, but it then appears to have had considerable importance. In 205 B.C., it became for a short time the head-quarters of Mago, the Carthaginian general, who destroyed it before leaving the country; but B.C. 203, the Roman pretor Sp. Lucretius, was commissioned to rebuild it. After Liguria was conquered by the Romans (B.C. 109) Genoa does not figure much in ancient history; but as a Roman *municipium*, it obviously prospered, for Strabo speaks of it as a 'flourishing town, and the chief emporium of the Ligurians.' Under the Romans, the Genoese retained a degree of internal independence, and were distinguished in the Roman legions by their valor and great physical vigor. On the dismemberment of the Latin empire, Genoa in common with the chief division of Italy, fell under the sway successively of the Lombards, the Franks, and the Germans; but amid all these vicissitudes, preserved, in a

singular degree, both its privileges and its prosperity. Navigation and commerce were the two natural sources opened to the Genoese by the maritime situation of their country, and for these pursuits they have at all times had special aptitude. Their mercantile interests served to foster the instinctive valor of the race. The rich merchandise of the Genoese galleys offered an alluring prize to the piratical hordes by which the Mediterranean was universally infested; consequently, from the rise of their commercial importance the Genoese were compelled to defend by the sword the precious freight of their merchantmen. Unhappily, a bitter intolerance of all maritime competition was a leading feature of early Genoese policy, in regard to the other important Italian states; and to this source may be traced the fierce and prolonged wars sustained by Genoa against the rival maritime republics of Pisa and Venice. The frequent incursions of the Saracens, by whom Genoa was sacked and pillaged about 935, led the Genoese to form an alliance with Pisa, with the object of extirpating these barbarous aggressors from the islands of Corsica and Sardinia, their strongholds in the Mediterranean. This being effected (1016–21), the Genoese obtained, by papal arbitration, the grant of Corsica, while Sardinia was assigned to the Pisans, a distribution which sowed the seeds of future discord between the two states. At the close of the 11th c., Genoa commanded large land and naval forces, and already ranked as a powerful maritime state, governed by annual magistrates, named consuls. The Genoese vigorously seconded the Crusades, and in return for their effective co-operation, obtained several important maritime possessions and commercial privileges in the Holy Land (1109). The chief events of the three following centuries are: the capture of Minorca (1146), of Almeria (1147), and Tortosa (1148) from the Moors; the wars with Pisa and Venice, and the civil dissensions by which Genoa, in common with all Italy, became distracted by the Guelph and Ghibelline factions. In 1284, at the great naval battle of Meloria, the Pisan republic sustained such destructive losses that her maritime influence and public spirit never revived. The wars with Venice originated, about 1244, in mutual jealousies respecting the commercial supremacy of the Levant, and continued, with various vicissitudes, till the end of the following century, when the Genoese, at the blockade of Chiozza, were compelled to submit to disadvantageous terms by the peace of Turin (1381).

Co-existent with these suicidal wars, the civil dissensions of Genoa exhausted and demoralized the state, and occasioned continual changes in the primitive form of government. In 1190, the consuls were superseded by a magistracy termed *podesta*, an office for which natives of Genoa were declared ineligible. This institution, founded in the hope of restraining local Genoese animosities and ambitions lasted till 1270, when two of the great Guelph leaders of the state resolved to subvert the popular authorities, and

under the title of 'captains of liberty,' assumed irresponsible authority, which, for 21 years, they contrived to retain. During their sway, civil feuds raged inveterately, not alone between the Guelph and Ghibelline factions, but also between the citizen ranks of patricians and plebeians. Various other modifications of the government preceded the election of the first Genoese doge 1339. This supreme magisterial office, from which all nobles were excluded, continued in force for two centuries, its tenure being for life.

The ambitious contentions of four leading democratical families—viz., the Adorni, the Fregosi, the Guarci, and the Montaidi—succeeded those of the patrician houses of Doria Spinola, Grimaldi, and Fieschi, and engendered such disastrous civil strife in the state under the early doges, that in 1396, the citizens, in despair, invoked the protection of the French king, Charles VI., and finally submitted to the rule of the Visconte, the tyrannical and ambitious lords of Milan (1464). After the invasion of Louis XII. in 1499 Genoa long remained subject to the French; but in 1528, the genius and resolution of a great citizen, Andrea Doria, freed his country from foreign invaders, and restored to Genoa its republican institutions. The last important exploit of the Genoese was the expulsion, 1746, of the Austrians, who were driven from Genoa after an occupation of three months. In 1768, Genoa ceded to France the Island of Corsica; and 1796 Bonaparte invaded Italy, and conferred on Genoa the name of the *Ligurian Republic,* which was abolished 1802 and *Genoa la Superba* became the chief town of a dept. of France. In 1815, by a decree of the Congress of Vienna, the state of Genoa became a province of Piedmont. Following the fortunes of that state, it has latterly become a portion of the kingdom of Italy, and with the enterprise of its people there are marked indications of improvement. Canale's *Nuova Storia della Repubblica di Genova;* Dinena's *Rivoluzioni d'Italia;* Sismondi's *Italian Republics.*

GENOA, Gulf of: large indentation in the n. shore of the Mediterranean, n. of Corsica, may be said to have the shape of a bay rather than of a gulf. The towns of Oneglia on the w. and Spezia on the e., seem to indicate the points at which the entrance of the Gulf commences: with this entrance the Gulf of Genoa extends 90 m. across, and 30 m. inland.

GENOESE, n. *jĕn′ō-ēz:* the inhabitants of *Genŏă,* a town of Italy.

GENOUILLÈRE, n. *zhĕn′ul-yėr′* [F. top of a boot, knee piece—from F. *genou;* L. *genu,* the knee: referring to the construction being about knee-high]: in *fort.,* that part of the parapet reaching from the platform to the sill of the embrasure, and covered by the fore part of the gun-carriage: in a *barbette battery,* height of the parapet above the banquette (see Fortification): metal armor for the knee.

GENRE-PAINTING or -Sculpture, *zhâng′r-* [F. *genre,*

kind, species]: in *painting* and *sculp.*, representation of the scenes and manners of everyday life, in distinction from historical or landscape painting. Originally, the term distinguished any special branch of art, as *genre historique* (historic painting), *genre du paysage* (landscape painting), etc. In a more special sense it denotes any picture containing human figures not included in the so-called historical or romantic class, particularly pictures with figures much below the size of life—cattle, architectural pieces, flower pieces, and representations of still life. Under the term genre-pictures are comprehended all pictures with figures representing individuals only as types of a species or class, in distinction from historical compositions, which present certain individuals, or, as it were, *nomina propria.* The mode of conception and style of execution in genre-painting may resemble the historical style; and on the other hand, historical personages may be represented merely in situations of everyday life: The term *historic-genre* is applied to both cases. The French likewise distinguish the *genre-historique* from the lower genre, strictly so called; they also occasionally apply the term *peinture du style* to historical painting. Genre pictures are usually of limited dimensions, while in historical pictures the figures are commonly the size of life or even colossal. In either case, however, there are many exceptions to the general rule, and the proper designation, depends rather on the style of subject than on the size. It is evident that the term is comprehensive and somewhat indefinite. A species of genre-painting with a distinct style was practiced even in ancient times, but the birthplace of the present genre-picture is the north, and more particularly the Netherlands. The Italians especially Paul Veronese, had previously showed a leaning to the genre style in biblico-historical pictures, by making the principal figures and the action subordinate to the accessories and locality—as, for example in his *Marriage at Cana:* and Van Eyck's school in the Netherlands had introduced the same element into the delineation of incidents in sacred history. Lucas Van Leyden and Albert Dürer then began to represent actual scenes from the everyday life of the people in painting and engravings. Genre-painting was brought to perfection in the Netherlands by a series of admirable painters, such as Terburg, Brower, Ostade, Rembrandt, the younger Teniers. Metzu, Gerard Dow, and others. Though the characteristic and humorous conception of many of the works of these masters gives them a peculiar value, it was found in other cases that a certain delicacy of imitation and skill in using the brush was capable of imparting a singular charm to the most ordinary scenes and figures. In the British school this style of art is generally understood to be limited to pictures with figures, and many works of the highest excellence have been produced in it, elevated in treatment by the introduction of an important element—viz., the dramatic.

GENS, *jĕnz* [allied to Lat. *genus*, Eng. *kin;* from the root *gen-*, to beget or produce]: Latin word, to which many important political and social meanings came to be attached; signifying properly, a race or lineage. From it the English words gentleman (q.v.), gentility, etc., have come through the French *gentilhomme*, the primary meaning of which was, one who belonged to a known and recognized stock. By the Romans Gens was used sometimes to designate a whole community, the members of which were not necessarily connected by any known ties of blood, though some such connection was probably always taken for granted: in this sense we hear of the *gens Latinorum, campanorum*, etc. But it had a far more definite meaning in the constitutional law of Rome. According to Scævola, the Pontifex, those alone belonged to the same *gens*, or were 'Gentiles,' who, satisfied the four following conditions—viz., 1. Who bore the same name; 2. Who were born of freemen; 3. Who had no slave among their ancestors; and 4. Who had suffered no *Capitis Diminutio* (reduction from a superior to an inferior condition) of which there were three degrees, Maxima, Media, Minima. The first (Maxima Capitis Diminutio) consisted in the reduction of a free man to the condition of a slave, and was undergone by those who refused or neglected to be registered at the census, who had been condemned to ignominious punishments, who refused to perform military service, or who had been taken prisoners by the enemy, though those of the last class, on recovering their liberty, could be reinstated in their rights of citizenship. The second degree (Media Capitis Diminutio) consisted in the reduction of a citizen to the condition of an alien (*Latinus* or *peregrinus*), and involved, in the case of a *Latinus*, the loss of the right of legal marriage (*connubium*), but not of acquiring property (*commercium*); and in the case of the *peregrinus*, the loss of both. The third degree (Minima Capitis Diminutio) consisted in the change of condition of a *paterfamilias* into that of a *filius familias*, either by adoption (*adrogatio*) or by legitimation. In the identity of name, some sort of approach to a common origin seems to be here implied. The gens thus consisted of many families, but all these families were supposed to be more or less nearly allied by blood—to be, as we should say, kindred. A Roman Gens was thus somewhat nearly identical with a Celtic clan, the identity or similarity of name being always supposed to have arisen from relationship, and not from similarity of occupation as in the case of the Smiths, Taylors, Lorimers, etc., of modern Europe, and in the United States. There was this peculiarity, however, about the Gens which did not belong to the clan—viz., that it was possible for an individual born in it to cease to belong to it by *capitis diminutio*, or by adoption, or adrogation as it was called when the person adopted was *Sui Juris* (q.v.). If the adoption was by a family of the same Gens, the gentile name, of course, remained unchanged. In the case of a person dying intes-

tate, his gentiles, failing nearer relatives, were his heirs, and they undertook the duties of guardianship in the like circumstances. The Gens was further bound together by certain sacred rights, imposed on the whole of its members, and for the celebration of which it probably possessed, in common property, a *sacellum* or sacred spot inclosed, and containing an altar and the statue of the god to whom it was dedicated. According to the traditional accounts of the old Roman constitution, the gentes were a subdivision of the curiæ, as the curiæ were subdivisions of the tribe. In this view, the original idea of the Gens becomes simply that of the smallest political division, without any relation to kindred or other ties.—See an excellent article on the Gens by George Long, with reference to the principal German authorities, in Smith's *Dictionary of Roman Antiquities.*

GENSAN (locally known as *Won-san*): seaport of Corea, province of Ham-gyong-do, at the s. extremity of Broughton Bay, on the sea of Japan. It is south of Port Lazaret, s.e. of Yong-heung, e. of Kowon, n. of Tok-won. There is considerable fertile ground in its vicinity, and gold is found in the mountains w. and n. w., but there is a long stretch of low ground on the Broughton Bay coast. Gensan was opened to Japanese trade and residence by treaty 1876.

GENSERIC, *jĕn'sėr-ĭk*, or GENSERICH, King of the Vandals: abt. 406–477 (reigned 427–477); b. Seville; illegitimate son of Godigiselus, who led the Vandals into Spain. After the death of his brother Gonderic, Genseric became sole ruler. In 429, he invaded Africa on the invitation of Count Boniface, viceroy of Valentinian III., Emperor of the West, who had been goaded on to rebellion through the machinations of his rival Aetius, conqueror of Attila. Genseric's army at first amounted to 50,000 warriors, full of barbarian valor, and hungry for conquest and plunder. As they swept along through Mauritania, the Kabyle mountaineers, and the Donatist heretics, maddened by persecution and fanaticism, swelled the terrible horde, and more than equalled their savage associates in acts of cruelty and bloodthirstiness. The friends of Boniface, astonished that the hero who alone had maintained the cause of the emperor and his mother Placidia during their exile and distress, should have been guilty of such a crime, attempted with ultimate success, to bring about an interview between the Count of Africa and an agent of the empress. Then, when too late, were the imaginary provocations which Count Boniface had received explained, and the fraud of Aetius detected; for the army that the count had hurriedly collected to oppose the Vandals, having been twice defeated by Genseric he was compelled to retire to Italy, where he was soon afterward slain by Aetius. All Africa w. of Carthage fell into the hands of Genseric, who shortly afterward seized Carthage itself, and made it (439) the capital of his new dominions. Part of Sicily, Sardinia,

and Corsica likewise were taken possession of by him. In 451, he encouraged Attila to undertake his great but fatal expedition against Gaul. Tradition states that, at the request of Eudoxia, widow of Valentinian, who was eager for revenge upon her husband's murderer Maximus, Genseric, 455, marched against Rome, which he took, and abandoned to his soldiers for 14 days. On leaving the city, he carried with him the empress and her two daughters, one of whom became the wife of his son Huneric. The empire twice endeavored to avenge the indignities that it had suffered, but without success. First the Western emperor, Majorian, fitted out a fleet against the Vandals 457, which was destroyed by Genseric in the bay of Carthagena; second, the Eastern Emperor, Leo, sent an expedition under the command of Heraclius and others, 468, which also was destroyed off the city of Bona. Genseric died in the possession of all his conquests, leaving behind him the reputation of the greatest of the Vandal kings. His appearance was not imposing; according to Jornandes, he was 'of low stature, and lame on account of a fall from his horse, but 'deep in his designs, taciturn, averse to pleasure, capable of being transported into fury, greedy of conquest, and cunning in sowing the seeds of discord among nations, and exciting them against each other.' Strange to say, a rude, even a savage religiosity burned in the heart of Genseric, and, it may be, grimly sanctified, in his own eyes, his widespread devastations. He seemed to have regarded himself as a 'scourge of God.' Once when leaving the harbor of Carthage on an expedition, the pilot asked him whither he was going. 'Against all who have incurred the wrath of God.' In creed, Genseric was a fierce Arian, and inflicted the severest persecutions on the orthodox or Catholic party.

GENT, n. *jĕnt:* in *familiar slang,* a contracted form of 'gentleman'; in a depreciative sense, a man who has vulgar show and pretensions, but not the birth, education, or manners of a gentleman.

GENT, a. *jĕnt* [contraction of *gentle*]: in *OE.,* gentle; delicate; fair; fine.

GENTEEL, a. *jĕn-tēl'* [F. *gentil,* graceful, genteel—from L. *gentīlĭs,* belonging to a nation or family—from *gens,* race, family]: polite; refined; well-bred; easy and graceful in manners GENTEEL'LY, ad. *-lĭ.* GENTEEL'NESS, n. quality of being genteel. GENTIL'ITY, n. *-tĭl'ĭ-tĭ,* good birth; the manners of well-bred people—SYN. of 'genteel': polished; well-bred; elegant; fashionable.

GENTIAN, n. *jĕn'shan* [OF. *gentiane,* gentian: L. *gentĭānă,* after *Gentĭŭs,* King of Illyria (vanquished by the Romans abt. B.C. 160), who first experienced the virtues of the plant]: (*Gentiana*): genus of plants of nat. ord. *Gentianaceæ,* with five-cleft—sometimes four-cleft—calyx, and one-celled capsule. The species are numerous, natives of temperate parts of Europe, Asia, and America, many of them growing in high mountain pastures and meadows, which they adorn by their beautiful blue or yellow flowers.

—The species chiefly used in medicine, Common Gentian, or Yellow Gentian (*G. lutea*), is abundant in the meadows of the Alps and Pyrenees, at an elevation of 3,000–6,000 ft. It has a stem about three ft. high, ovate-oblong leaves, and numerous whorls of yellow flowers. The part employed in medicine is the root, which is cylindrical, ringed, and more or less branched. Although Gentian root has been examined by various chemists, its constituents are not clearly known; it contains, however (1), an oil in small quantity; (2), a pale yellow crystalline matter, termed gentisin or gentisic acid; (3), a bitter principle, gentianite, on which its medicinal properties mainly depend; (4), pectin or pectic acid, which probably causes the gelatinization that sometimes occurs in infusion of Gentian; and (5) sugar, in consequence of which an infusion is capable of undergoing vinous fermentation, and of forming the 'bitter snaps' or 'engiangeist' much used by the peasants on the Swiss Alps, to fortify the system against fogs and damps. Gentian is a simple tonic, bitter without astringency, much used in diseases of the digestive organs. It may be administered in the form of infusion, tincture, or extract. The bitter principle on which its virtue depends exists also in other species of this genus, probably in all, and appears to be common to many plants of the same order. The roots of *G. purpurea*, *G. punctata*, and *G. pannonica*, are often mixed with Gentian of commerce. They are deemed inferior.—*G. catesbæi*, N. American species, is extensively used as a substitute for Common Gentian, and *G. kurroo* is employed in the same way in the Himalaya.—Several species of Gentian are common ornaments of gardens, particularly *G. acaulis*, a small species with large blue flowers, native of the continent of Europe and of Siberia, often planted as an edging for flower-borders. Of N. American species, *G. crinita*, 'fringed gentian,' is particularly celebrated for the beauty of its flowers, which are large, blue, and fringed on the margin. It has a branched stem, and grows in wet ground. The brilliancy of the flowers of the small Alpine species has led to many attempts to cultivate them, generally unsuccessful.

GENTIANACEÆ, *jĕn-shĭ-an-ā′sē-ē*, or Gentianeæ, *jĕn-shĭ-ā′nē-ē:* natural order of exogenous plants, chiefly herbaceous, but containing also a few small shrubs. The leaves are opposite, rarely alternate, destitute of stipules. The flowers are terminal or axillary, generally regular. The calyx is divided usually into 5, sometimes 4, 6, 8, or 10 lobes; the corolla is hypogynous (q.v.), has the same number of divisions with the calyx, and a plaited or imbricated twisted æstivation. The stamens are inserted upon the corolla, alternate with its segments, and equal to them in number. The ovary is composed of two carpels, 1-celled or imperfectly 2-celled, many seeded. The fruit is a capsule or berry.—The species are numerous, about 450 being known. They are natives both of warm and of cold climates, but rather of elevated regions in the torrid and temperate zones, than of cold regions near the poles. Many have

flowers of great beauty, both of color and form, the corolla being often most delicately fringed. Many are medicinal: see GENTIAN: CHIRATA: FRASERA: BUCKBEAN: CENTAURY.

GENTIANELLA, *jĕn-shĭ-an-ĕl'lă:* name sometimes given to the small-flowered or autumnal Gentian (*Gentianæ Amarella,*) the beautiful blue flowers of which adorn some of the dry pastures of Britain; but more commonly to the species of *Cicendia,* another genus of the order *Gentianaceæ. C. hyssopifolium* is much used as a stomachic in India.

GENTIL, a. *jĕn'tĭl* [F. *faucon-gentil*—that is, a falcon-genteel. L. *gentīlĭs,* of a nation or family]: handsome; graceful; applied to a female falcon which has attained her mature plumage.

GENTILE, n. *jĕn'tīl* [F. *gentil,* a gentile, a heathen—from L. *gentīlĭs,* belonging to the same clan or house—from *gens,* a race, a stock: It. *gentile*]: one belonging to the nations of the world in general, as opposed to the Jews; a heathen. The apostle Paul classes the Greeks as Gentiles. The Mormons of Utah give the name Gentiles to all who are not Mormons, Jews, or Indians (the Indians they believe to be descendants of the lost tribes of Israel).—In the usage of anc. Rome, gentiles were those belonging to the same *gens* (q.v.), therefore accounted as akin. ADJ. of or pertaining to pagans or heathens. GEN'TILISM, n. *-ĭzm,* heathenism; paganism. GEN'TILI'TIOUS, a. *-tĭ-lĭsh'ŭs,* peculiar to a people or nation; hereditary.

GENTILESCHI, *jĕn-tē-lĕs'kē,* ARTEMISIA DE: painter: 1590–1642; daughter of Orazio de Gentileschi. She studied with her father and Guido, became renowned for portrait-painting—her fame in this line exceeding her father's; accompanied her father to England where she painted portraits and other pictures, declined an offer of marriage by Agostino Tasi, married Pier Antonio Schiattesi, and passed the greater part of her life in Bologna and Naples. Her best known work is *Judith and Holofernes* in the Pitti Palace, Florence, and next to this ranked *David with the Head of Goliath,* painted for Charles I. of England.

GENTILESCHI, ORAZIO DE: 1565–1646; b. Pisa: Italian painter. He studied painting with his half-brother, Aurelio Lomi, and on removing to Rome became associated with Agostino Tasi, landscape painter. He painted the figures for the landscape backgrounds of Tasi in the Palazzo Rospigliosi, and, according to some authorities those in the great hall of the Quirinal Palace, though Lanfranchi also is credited with the latter work. At an advanced age he went to England on the invitation of Charles I. and was employed in decorating Greenwich Palace at the time of his death. Vandyck included Gentileschi's portrait in his collection of 100 illustrious men. Gentileschi's best works are in the Palazzo Borghese, Rome, *St. Cecilia* and *St. Valerian;* in the Palazzo Doria, Genoa, *David after the Death of Goliath;* and in the royal palace, Turin.

GENTILITY, n. See under GENTEEL.

GENTILLY, *zhŏng-tē-yē′:* populous town of France, in the metropolitan dept. of Seine: near Paris, toward the south of that city. The great bastioned wall of Paris passes through the town, separating it into two portions, called Great and Little Gentilly. The people are employed in the manufacture of chemicals, in quarrying, and in laundry-work. Pop. 12,353.

GENTLE, n. *jĕn′tl* [unascertained]: the larva of the flesh-fly, as well as other insects, found in carrion—used by anglers as bait.

GENTLE, a. *jĕn′tl* [F. *gentil,* genteel, graceful—from L. *gentīlĭs,* belonging to a race, clan, or house: It. *gentile,* of a noble race or family]: well-born; mild; amiable; meek; soothing; pacific; not rough or violent: N. in *OE.,* a gentleman; a man of birth: V. in *OE.,* to make gentle; to ennoble. GENT′LY, ad. *-lĭ,* softly; tenderly. GEN′TLENESS, n. *-nĕs,* softness of manners; mildness of temper; tenderness. GENTLEMAN, n. *jĕn′tl-măn* [from *genteel,* and *man:* F. *gentilhomme*]: in *England,* in a general sense, every educated person above a laborer, an artisan, or a tradesman; an individual possessed of the conduct, character, habits, and outward appearance which belong, or are expected to belong, to persons born and educated in a high social position; a man in any station of life who is possessed of good breeding and refined manners, strict integrity and honor, kindness of heart, and like qualities; in a limited sense, a person of fortune and good family, whether titled or not; one who bears a coat of arms; a term of complaisance or respect, as in the plural—*gentlemen,* when addressing a number of persons; the legal term in England for any one not engaged in business; in the *United States,* any man of respectable character and behavior. GEN′TLEMANLY, a. *-lĭ,* becoming a gentleman; also GEN′TLEMANLIKE, a. GEN′TLEMANLINESS, n. *-lĭ-nĕs.* GENTRY, n. *jĕn′trĭ* [OE. *gentrise*—from OF. *genterise,* rank—from OF. *gentilise*]: the persons possessed of landed property, holding rank between the nobility and the middle classes; in *OE.,* civility; the manners of gentlemen. GENTLEWOMAN, n. *jĕn′tl-wûm′-ăn,* a woman of good family, or of good breeding. GENTLE-HEARTED, a. kind. GENTLEFOLKS, n. plu. *-fōks,* persons distinguished by their birth or position. GENTLEMAN-COMMONER: see UNIVERSITY: OXFORD: CAMBRIDGE.—GENTLEMAN-USHER, one who ushers persons into the presence of a sovereign. GENTLEMAN-USHER OF THE BLACK ROD, an officer belonging to the Garter whose duty it is to attend the house of lords while parliament is sitting, and to carry messages to the house of commons. GENTLEMAN-USHER-OF THE GREEN ROD, an officer of the Order of the Thistle. GENTLEMEN-AT-ARMS (formerly the *Gentlemen Pensioners*), a corps of 40 gentlemen, with a capt., lieut., standard-bearer, and clerk, the body-guard of the British sovereign on state occasions; with the exception of the yeomen of the guard, the oldest corps in the British service; instituted 1509 by Henry VIII. The commissions

are now given only to military officers of service and distinction.—Syn. of 'gentle': soft; bland; tame; placid; quiet; peaceful; tractable; docile; well-born.

GEN'TLEMAN: in its large sense, any man of respectable character and behavior. For more limited meanings, see above, Gentleman. This word is an example of those compromises so frequent in English between the language introduced by the Normans, and that in possession of the country at the period of the Conquest. The Norman word was, as the French word is now, *gentilhomme*. The first syllable was retained, while the second was abandoned in favor of its Saxon equivalent *man*. Though commonly translated into Latin by Generosus, which means a generous, liberal, manly person, in short, a gentleman, the word gentleman is derived from *gentilis*, and *homo*, or man; and *gentilis* in Latin did not signify gentle, generous, or anything equivalent, but *belonging to a gens*, or known family or clan. See Gens. A gentleman was thus originally a person whose kindred was known and acknowledged; which is the sense in which it is still employed when it is not intended to make any reference to the moral or social qualities of the particular individual. One who was *sine gente*, on the other hand, was one whom no *gens* acknowledged, and who might thus be said to be ignobly born.

The term gentleman is continually confounded with esquire (q.v.), even by such learned authorities as Sir Edward Coke. But they are not equivalent; and while some attempt can be made to define the latter, the former seems in England, from a very early time, to have been a mere social epithet. 'Ordinarily, the king,' says Sir Thomas Smith, 'doth only make knights and create barons, or higher degrees; as for *gentlemen*, they be made good cheap in this kingdom; for whosoever studieth the laws of the realm, who studieth in the universities, who professeth the liberal sciences, and (to be short) who can live idly, and without manual labor, and will bear the port charge, and countenance of a gentleman, he shall be called Master, for that is the title which men give to esquires and *other gentlemen*, and shall be taken for a gentleman.'—*Commonwealth of England*, i. c. 20. But though such was the real state of matters, even in the beginning of the 17th c., the word was still held to have a stricter meaning, in which it was more nearly synonymous with the French gentilhomme, for in the same chapter the same writer remarks that 'gentlemen be those whom their blood and race doth make noble and known.' Even here, however, it scarcely seems that he considered any connection with a titled family to be necessary to confer the character, for he afterward speaks of it as corresponding not to nobility, in the English sense, but to *nobilitas*, in the Roman sense, and as resting on 'old riches or powers remaining in one stock.' There can be no doubt that, in still earlier times, patents of gentility were granted by the kings of England. There is

one still in existence by Richard II. to John de Kingston, and another by Henry VI. to Bernard Angevin, a Bourdelois. But these patents determine very little, for they seem to have carried the rank and title of esquire; and there is no doubt that esquires, and all persons of higher rank, were held to be gentlemen, on the principle that the greater includes the less. The difficulty is to say whether in England, between an esquire, who certainly was entitled to the character, and a yeoman, who was not, there was an intermediate class who could claim it on any other grounds than courtesy and social usage. These patents corresponded to the modern patents of arms issued by the Heralds' Colleges in England and Ireland, and by the Lyon Office in Scotland, and were probably given on the very same grounds—viz., the payment of fees. A patent of arms confers the rank of esquire, and there probably is no other legal mode by which an untitled person can acquire it, unless he be the holder of a dignified office. In present as in former times, it is common to distinguish between a gentleman by birth and a gentleman by profession and social recognition. By a gentleman born is usually understood either the son of a gentleman by birth, or the grandson of a gentleman by position; but the phrase is loosely applied in England to all persons who have not themselves 'risen from the ranks.'

GENTOO, n. *jĕn-tô'* [Port. *gentio*, gentile, pagan]: old name for the pagan natives of India, now obsolete, or applied only to the savage Indians of the interior. The word Hindu is now used instead.

GENTRY: see under GENTLE.

GENTZ, *gĕnts*, FRIEDRICH VON: 1764, May 2—1832, June 9; born Breslau, Germany: political writer. His father was employed in the Prussian civil service and his mother was a distant relation of the statesman Ancillon. On his father's promotion to the directorship of the mint at Berlin, he was sent to a gymnasium at the capital and afterward to the Univ. of Frankfort-on-the-Main. He was considered more than ordinarily stupid intellectually till his 21st year, when his mind was quickened by listening to Kant's lectures at Königsberg, and he rapidly mastered the Greek and Latin languages and became familiar with French and English. He returned to Berlin, gained a footing in the highest social and diplomatic circles, and became noted for his gallantries, passion for gambling, and political authorship. In 1786 he was appointed private sec. to the royal general directory and soon afterward promoted to war-councilor; 1793 published a translation into German of Burke's *Essay on the French Revolution:* 1794 translated and annotated Mallet du Pau's work on the same subject, and 1795 Monnier's; 1797 published a pamphlet addressed to Frederick William III. of Prussia on his accession, indicating the duties of the new sovereign: and 1797–1800 published a series of articles, *On the Origin and Character of the War against the French Revolution.*

Subsequently he prepared numerous papers on taxes and finances for various British ministries; negotiated an alliance between Great Britain and Austria; drew up the Austrian manifesto of 1805, and, under Prince Metternich's instructions, that of 1809; was first sec. to the congress of Vienna 1814, Paris 1815, Aix-la-Chapelle 1818, Carlsbad and Vienna 1819, Troppau and Layback 1820–21, and Verona 1822; and at one time was paid by Prussia, Austria, and England to write pamphlets against Napoleon.

GENUANT, a. *jĕn′ū-ant:* in *her.*, kneeling.

GENUFLECTION, n. *jĕn′ū-flĕk′shŭn* [F. *génuflexion*—from mid. L. *genuflexĭōnem*—from L. *genu*, the knee; *flecto*, I bend or incline]: act of kneeling or bending the knee, particularly in worship. GENUFLECT, v. *jĕn′ū-flĕkt*, to bend the knee as in worship. GENUFLEC′TING, imp. GENUFLEC′TED, pp.—As an act of adoration, or reverence, there are frequent allusions to genuflection in the Old and New Testament; as Gen. xvii. 3, 17; Num. xvi. 22; Luke xxii. 41; Acts vii. 60. and ix. 40; Philip. ii. 10. That the use continued among the early Christians is plain from the *Shepherd* of Hermas, from Eusebius's *History*, ii. 33, and numberless other authorities; and especially from the solemn proclamation made by the deacon to the people in all the liturgies—'Flectamus genua' (Let us bend our knees); whereupon the people knelt, till, at the close of the prayer, they received a corresponding summons—'Levate' (Arise). It is worthy of remark, however, that in celebration of the up-rising (resurrection) of our Lord, the practice of kneeling down at prayer, as early as the age of Tertullian, was discontinued throughout the Easter-time, and on all Sundays through the year—these being deemed seasons of joyful worship. The kneeling posture was especially assigned as the attitude of penance, and one of the classes of public penitents in the early church took their name, *genuflectentes*, from this circumstance. In the modern Rom. Cath. Church, the act of genuflection belongs to the highest form of worship, and is frequent during the mass, and in the presence of the consecrated elements when reserved for subsequent communion. In the Anglican Church, the rubric prescribes the kneeling posture in many parts of the service; and this, as well as the practice of bowing the head at the name of Jesus, was the subject of much controversy with the Puritans. The same controversy was recently revived in Germany.

GENUINE, a. *jĕn′ū-ĭn* [L. *genŭīnŭs*, peculiar, natural—from *gĕnō*, I beget, I bring forth: It. *genuino*]: real; natural; not spurious; not adulterated. GEN′UINELY, ad. *-lĭ*. GEN′UINENESS, n. *-nĕs*, purity; reality; freedom from adulteration or mixture: see AUTHENTIC.—SYN. of 'genuine': authentic; true; unadulterated; pure; unalloyed; native; unsophisticated.

GENUS, n. *jē′nŭs*, GENERA, n. plu. *jĕn′ĕr-ă* [L. *genus*; Gr. *genos*, birth, descent]: that which has several species under it; a number of groups of individuals having certain

characters in common, each group being called a species; a group; a kind. GENERIC, a. *jĕ-nĕr′ĭk*, pertaining to a genus, race, or kind.

GE′NUS, in Natural History: a group of species (q.v.) closely connected by common characters or natural affinity (see GENERALIZATION). In all branches of zoology and botany, the name of the genus forms the first part of the scientific name of each species, and is followed by a second word—either an adjective or substantive—which distinguishes the particular species. Thus, in *Solanum tuberosum* (the potato), *Solanum* is the *generic*, and *tuberosum* the *specific* (sometimes styled the *trivial*) name. This method was introduced by Linnæus, and has been of great advantage to the progress of science, simplifying the nomenclature, and making names serve, in some measure, for the indication of affinities. The affinities indicated by the generic name are often recognized even in popular nomenclature—thus, Elm and *Ulmus* are perfectly synonymous; but there are many instances in which this is very far from being the case, as that of the genus *Solanum*. The arrangement of species in groups called genera has no real relation to any of the important questions concerning species.—Genera are arranged in larger groups called *orders*, which are often variously subdivided into *sub-orders*, *families*, *tribes*, etc. Genera themselves are grouped together in *classes*, which are assigned to *divisions* of one or other of the *kingdoms* of nature. Some genera contain hundreds of species; others no more than one; and though future discoveries may add to the number in many of the smaller genera, yet doubtless a great difference exists in the number actually belonging to groups equally distinct and natural. Some of the larger genera are, by some authors, divided into sub-genera; and too many naturalists show extreme anxiety to multiply generic divisions and names, perhaps forgetting that while certain affinities may be thus indicated, the indication of others is necessarily lost, while the memory of every student of science is more and more heavily burdened. To a certain extent the fluctuations of nomenclature, so often felt to be annoying, mark the progress of science and the removal of errors. In Mineralogy, the generic name is not adopted as the primary part of the name each of species. *Gem* (q.v. is an example of a mineralogical genus.

GENZANO, *jĕn-zâ′nō*, or GENSANO, *jĕn-zâ′nō:* town of the province of Rome, Italy, 17 m. s. by e. from Rome, in a district of hills and ravines. Genzano has several broad and straight streets, proceeding from a handsome square ornamented with a beautiful fountain. On one of the hills above the town is the feudal mansion of the Cesarini family. Genzano is notable for an annual festival, on the eighth day after *Corpus Christi*, called the *Infiorata di Genzano*, from the custom of strewing the streets with flowers to represent arabesques, heraldic devices, figures, etc. The festival attracts many visitors from Rome. Pop. 5,000.

GEO-, prefix, *jē-ō-* [Gr. *gea, gē,* the earth]: frequent prefix in words derived from Greek, and referring to the earth as geography, geology, etc.

GEOCALYX, n. *jē-ō-kā'liks* [prefix, *geo-;* L. *calyx* (q.v.)]: in *bot.*, typical genus of *Geocalycidæ,* a family of *Jungermanniaceæ,* sub-ord. *Jungermanneæ.*

GEOCENTRIC, a. *jē'ō-sĕn'trĭk,* or GE'OCEN'TRICAL, a. *-trĭ-kăl* [Gr. *gē,* the earth: *kentron,* the centre]: having the centre of the earth for its centre—applied to the position of a celestial object as viewed from the earth; thus the moon's motions are geocentric; also, though no other of the heavenly bodies revolves round the earth, yet their motions are spoken of as geocentric when referred to, or considered as they appear from, the earth. The geocentric latitude of a planet is the inclination to the plane of the ecliptic of a line connecting it and the earth; the geocentric longitude being the distance measured on the ecliptic from the first point of Aries to the point in the ecliptic to which the planet as seen from the earth is referred.

GEOCORES, n. *jē-ŏk'o-rēz* [prefix *geo-;* Gr. *koris,* a bug]: land-bugs; type of *Geocorizæ,* a section, group, or tribe of insects, sub-order *Heteroptera.* The antennæ are always visible, and the legs are formed for running. The bed bug is one of them. Westwood calls them *Auricorizæ* (air-bugs) rather than *Geocorizæ* (land-bugs), for some are found on the surface of the water, going far out even on the sea. There are nine sub-tribes or families.

GEOCYCLIC, a. *jē-ō-sī'klĭk* [prefix *geo-; cyclic*]: of or belonging to the revolutions of the earth; periodically encircling the earth. GEOCYCLIC-MACHINE, machine for exhibiting the natural processes by which day and night and the seasons are producted.

GEODE, n. *jē'ōd* [F. *géode,* eagle-stone: Gr. *gaiōdēs,* earthy—from *gē* or *gaiă,* the earth]: round or roundish lump of a stony substance, a hollow concretion or indurated nodule, often empty, sometimes containing a more or less solid and free nucleus, and having the cavity frequently lined with crystals. Geodes are called sometimes 'potato stones,' from their size and shape. The name may have been given them because they are occasionally found filled with a soft earthy ochre.

GEODEPHAGA, n. *jē-o-dĕf'a-ga* [prefix *geo-;* Gr. *adēphagos,* gluttonous, greedy]: one of the two leading tribes of carnivorous beetles, comprehending those which live on land as distinguished from hydradephaga, those inhabiting water. It contains the two families of *Carabidæ* and *Cicindelidæ.*

GEODESY, n. *jē-ŏd'ĕ-sĭ* [Gr. *gĕōdaisĭă*—from *gē,* the earth; *daiō,* I divide: F. *géodésie*]: branches of mathematics applied to the determination of the magnitude and figure of the whole earth, or of any large portion of its surface, and to the construction of maps. GEODESIC, a. *jē'ō-dĕs'ĭk,* and GE'ODES'ICAL, a. *-ĭ-kăl,* also GEODETIC, a. *jē'ō-dĕt'ĭk,* and

GE′ODET′ICAL, a. *-ĭ-kăl*, pertaining to the art of measuring large portions of the earth's surface, ascertaining its figure, etc.

GEOD′ESY: science of the measurement of the earth's surface, and of great portions of it. Geodesy has many physical difficulties to contend against. In measuring a particular length with a view of obtaining a base line for calculating other lines by trigonometrical observations, there is first a difficulty in the use of the unit of length, whatever it may be, whether rod or chain. In the use of rods, it is difficult to lay them all precisely in the same direction, and to prevent error arising from intervals between the rods. In the use of chains the greatest care is needed to keep all the links stretched, while the difficulty of avoiding error through not preserving the line of direction is but little diminished. Further, in all cases, the tendency of the units to change magnitude with changes of temperature, and the unevenness of the earth's surface, are sources of error. After all these difficulties have been overcome, and a sufficient base line obtained, a new class of difficulties are encountered. In taking trigonometrical observations of distant objects, it is found that the three angles of any triangle which we may form are together in excess of two right angles; the angles are, in fact, more of the nature of spherical than plane angles: for this, in using the angles as plane angles (for greater simplicity), a correction has to be made. Further, a correction is required for the effect of horizontal refraction on the results of observations on distant objects—a most fluctuating source of error—to evade which, so far as possible, it is usual to make observations when the atmosphere has been for some time undisturbed. See EARTH; TRIANGULATION.

GEOFFREY OF MONMOUTH, *jĕf′ri ov mŏn′mŭth*, called also JEFFREY AP ARTHUR: born at Monmouth; consecrated Bishop of St. Asaph 1152; d. abt. 1154. His chief work, *Chronicon sive Historia Britonum*, seems to have been completed about 1128. It is a tissue of the wildest fables, interwoven with some historic traditions. 'In later times,' says Dr. Lappenberg, 'authors seem to have unanimously agreed in an unqualified rejection of the entire work, and have therefore failed to observe that many of his accounts are supported by narratives to be found in writers wholly unconnected with, and independent of Geoffrey. He professes to have merely translated his work from a chronicle in the British tongue, called *Brut y Brenhined*, or History of the Kings of Britain, found in Brittany, and communicated to him by Walter, Archdeacon of Oxford [not, as has been supposed, Walter Mapes, but an earlier Walter Calenius]. The *Brut* of Tysilio has, with some probability, been regarded as the original of Goeffrey's work, though it is doubtful whether it may not itself be rather an extract from Geoffrey. That the whole is not a translation appears from passages interpolated, in many places verbatim, from the existing work of Gildus, of whom he cites another work

De Vita Ambrosii, no longer extant.' Geoffrey's work was first printed by Ascensius, Paris 1508, and has been reprinted more than once. An English translation, by Aaron Thompson, appeared London 1718, reprinted by Dr. Giles 1842, and in Bohn's Antiquarian Library 1848. Whatever its value as a historical record, the Chronicle has been of great use to literature. Versified in the Norman dialect by Wace, and again in English by Layamon, we are indebted to it for the story of Lord Sackville's tragedy of *Ferrex and Porrex*, for Shakespeare's *King Lear*, for some of the finest episodes in Drayton's *Polyolbion*, and for the exquisite fiction of Sabrina in Milton's masque of *Comus*. A metrical *Life and Prophecies of Merlin*, printed first at Frankfurt 1603, reprinted for the Roxburghe Club 1830, has been attributed to Geoffrey of Monmouth, but without sufficient grounds.

GEOFFRIN, *zho-frăng'*, MARIE THÉRESE: 1699, June 2—1777, Oct.; b. Paris; daughter of a valet-de-chambre named Rodet, native of Dauphiné. In her 15th year she was married to a very rich manufacturer in the Faubourg St. Antoine, who died not long afterward, leaving her an immense estate. Madame Geoffrin, though imperfectly educated, had a genuine love of learning, and her house soon became a rendezvous of the philosophers and *littérateurs* of Paris. No illustrious foreigner visited the city without obtaining an introduction to her circle; even crowned heads were among her visitors. Her liberality to men of letters, and especially the delicacy with which she conferred her benefits, reflect honor on her character. Among those who frequented her house was Poniatowski, afterward king of Poland. He announced to her his elevation to the throne in these words: '*Maman, votre fils est roi.*' In 1766, he prevailed on her to visit Warsaw, where she was received with the greatest distinction. Subsequently, in Vienna, Empress Maria Theresa and her son, Joseph II., honored her with a most gracious reception. She left legacies to most of her friends. Toward the publication of the *Encyclopédie* she contributed, according to the calculations of her daughter, more than 100,000 francs. D'Alembert, Thomas, and Morellet wrote éloges upon her, which are in the *Eloges de Madame Geoffrin* (Paris, 1812). Morellet likewise published her treatise *Sur la Conversation*, and her *Lettres*.

GEOFFROY SAINT-HILAIRE, *zho-frwâ' săng-te-lär'*, ETIENNE: 1772–1844; b. Etampes, France: zoologist and physiologist. He was intended for the clerical profession, and was sent to the college of Navarre, where the lectures of Brisson speedily awakened in him a taste for natural sciences. He became a pupil of Haüy (q.v.) and of Daubenton; and his relations with his teachers decided the future prospects of Geoffroy and saved the life of Haüy, who had been imprisoned as a refractory priest, and whom Geoffroy rescued from prison on the very eve of the massacres of 1792, Sep. A few months afterward, Haüy

obtained for him the post of sub-keeper and assistant-demonstrator at the Jardin des Plantes; and 1793, June, on the reorganization of the institution, he was nominated, at the age of 21, prof. of the zoology of vertebrated animals. He immediately commenced the menagerie at the Jardin des Plantes, its beginning being three itinerant collections of animals that had been confiscated by the police, and were conveyed to the museum. His vigorous administration soon made the zoological collection the richest in the world. In 1795 Geoffroy invited Georges Cuvier—then an obscure young man in the wilds of Normandy of whose investigations he had heard—to come to Paris, 'and assume the place of a new Linnæus, and become another founder of natural history.' This prophetic summons was the beginning of an intimate friendship.

In 1798, Geoffroy formed one of the scientific commission that accompanied Bonaparte to Egypt, and he remained in that country until the surrender of Alexandria 1801. In 1807 he was elected into the Acad. of Sciences; 1808 was charged with a scientific mission to Portugal; on his return was appointed prof. of zoology in the Faculty of Science at Paris. In the latter years of his life, he was stricken with blindness, but the physical repose to which he was consequently condemned, seemed to increase his intellectual activity; and to the very last days of his life he was occupied with those abstruse questions of biology which had influenced his whole scientific career. He died in Paris. His writings aim to establish one great proposition—the unity of the organic plan of the animal kingdom. This was the point on which he and Cuvier mainly differed in their very warm discussions in the Acad. of Sciences, 1830. In addition to numerous memoirs in scientific periodicals, his published works include these with others: *Philosophie Anatomique* (2 vols. 1818–20), an exposition of his theory; *Principes de la Philosophie Zoologique* (1830), synopsis of his discussions with Cuvier; *Etudes Progressives d'un Naturaliste* (1835); *Notions de Philosophie Naturelle* (1838); and (with Frédéric Cuvier), *Histoire Naturelle des Mammifères* (3 vols. folio 1820–42). His son has published an excellent history of his life and labors, under the title, *Vie, Travaux, et Doctrine Scientifique d'E. Geoffroy Saint-Hilaire* (1848); see also *L'Eloge Histoique de Geoffroy Saint-Hilaire* by Flourens; and an admirable sketch of his life and doctrines in Appendix to De Quatrefages's *Rambles of a Naturalist*, I. 312–324.

GEOFFROY SAINT-HILAIRE, Isidore: physiologist and naturalist: 1805-61; b. Paris; son of Etienne Geoffroy. Educated in natural history by his father, he became asst. naturalist at the museum when only 19 years of age, and in 1830 he delivered the zoological lectures in that institution as his father's substitute. The science of Teratology (q.v.), or of the laws which regulate the development of monstrosities, which had occupied much of his father's attention, was taken up with great zeal by the son; and 1832 he published vol. I. of his *Histoire Générale et Particulière des*

Anomalies de l'Organisation chez l'Homme et les Animaux, ou Traité de Tératologie, the third and concluding volume of which did not appear till 1837. This work is of extreme value, and will always serve as the starting-point for those who may occupy themselves with this branch of biology. Valuable are also his *Domestication et Naturalisation des Animaux Utiles* (1854), and (papers of) *Société pour l'Acclimatation des Animaux Utiles*. In 1852, he published vol. I. of a great work, *Histoire Générale des Règnes Organiques*, in which he intended to develop the doctrine of his father but which was left unfinished at his premature death, which occurred at Paris. He was a strong advocate of the use of horse-flesh as human food, and published his *Lettres sur les Substances Alimentaires et particulièrement sur la Viande de Cheval* (1856).

GEOGLOSSUM, n. *jē-ō-glŏs'sŭm* [prefix *geo-;* Gr. *glossa*, the tongue]: in *bot.*, earth tongue; genus of ascomycetous fungi, sub-order *Elvellacei*. They occur chiefly in Europe, on closely shaven lawns, on pastures, and sphagnous (mossy) bogs. None are eatable.

GEOGNOSY, n. *jē-ŏg'nō-sĭ* [F. *géognosie*—from Gr. *gē*, the earth; *gnōsĭs*, knowledge—from *gnŏō*, I know]: term now little used by British and American writers, but still employed in Germany as a synonym of geology, or, more properly, as restricted to the observed facts of geology apart from reasonings or theories built on them. GE'OGNOST, n. *-nōst*, one who examines the large features of a country, its mountain ranges, valleys, water-system; and the nature and position of the rocks, without grouping them in the order of succession. GE'OGNOS'TIC, a. *-nŏs'tĭk*, pertaining to.—Of necessity, geognosy preceded geology; it was indeed geology in its early imperfect condition when it was merely a record of observed facts; but as soon as these assumed scientific form, and were arranged into a system, then geognosy disappeared; for even in the examination of new and unexplored territories, the data supplied by the science of geology enable us to refer the strata with certainty to their true chronological position.—The word geognosy has been employed to designate also that department of geology which treats of the physical characteristics of rocks; that is, of their chemical composition, internal structure, planes of division, position and other properties, and peculiarities belonging to them simply as rocks.

GEOGONY, n. *jē-ŏg'ŏ-nĭ* [Gr. *gē*, the earth; *gonē*, generation]: the doctrine of the formation of the earth. GEOGONIC, a. *jē'ō-gŏn'ĭk*, pertaining to geogony.

GEOGRAPH'ICAL DISTRIBUTION OF PLANTS AND ANIMALS: branch of scientific inquiry whose interest and importance have grown rapidly in recent years. In chief measure this is due to the totally different significance given to the inquiry by the Darwinian views of the Origin of Species. See SPECIES; also FAUNA; FLORA. As long as it was held that each species must have been

created, as a general rule, within the geographical area which it now occupies, the most curious facts of distribution could be regarded only with 'sterile wonder'; but when the theory came to be entertained that allied-species have had a common origin, it was inferred that they or their ancestors must have had a common birthplace; and consequently, when we find members of a group severed from their nearest kindred, we feel bound to inquire as to the cause. Thus, when it is observed that all the W. Indian mammals, with one exception, are allied to those of America, it is inferred that the ancestors of these animals were derived from that continent, and the question arises how the passage was made from the mainland to the islands. The problem becomes much more difficult when we find that the single exception referred to belongs to a family that is most closely allied to one inhabiting Madagascar only. Similarly, we have to explain how the tapirs are confined to the Malayan region and South and Central America; the *Camelidæ* to the deserts of Asia and the Andes; marsupials to the Australian region and America; how the mammals and birds of N. America resemble those of Europe more than those of S. America; how the flora of Japan presents greater affinities to that of the Atlantic than to that of the Pacific States of N. America; and so on. The consideration that must be taken into account in dealing with these problems are numerous and complex. The nature of the more important facts affecting the solutions is here indicated. One of the principal sources of light on this subject is in the consideration of the means by which animals and plants are able to disperse themselves across the barriers at present existing.

It is important, in the first place, to draw attention to the facilities for diffusion possessed by animals endowed with great locomotive powers, especially among land animals those having the power of flight; and particularly important in this respect is the fact that some animals, which in the adult state have only feeble powers of locomotion, are better endowed in an earlier stage of existence; e.g. univalve and bivalve marine mollusks, all developed from free-swimming larvæ.

But besides the normal means of locomotion, there are many other important modes of dispersal. First, there is the power of winds as distributing agents. The carrying power of winds is known to be sufficient to bear fine dust across seas many hundreds of miles in width; thus, this agency alone is adequate to account for the dispersion of all plants propagated by minute spores; and the distribution of most cryptogamic plants hardly forms part of the problem under consideration, and may be left out of the present account. What part winds may have had in carrying the seeds of phanerogamous plants across arms of the sea, is more doubtful; but there are observations which show that even for such seeds, especially when provided with some kind of feathery appendage, winds may occasionally serve as means of transport for very long dis-

tances. Thus, Berthelot records, that after a violent hurricane he saw an annual belonging to the *Compositæ* (*Erigeron ambiguus*), widely distributed throughout the Mediterranean region, suddenly appear at various spots on the Canary Islands, where it was previously unknown, so that there could be hardly any doubt that the seeds had been blown across from Portugal or n. Africa. Nevertheless, De Candolle has shown that seeds provided with a pappus are not on an average more widely distributed than those members of the *Compositæ* which are not so provided, so that such a case as that just mentioned must be looked upon as quite exceptional. But the exceptional means of transport are those most important to consider with reference to the problems of distribution, since these often serve to explain peculiarities otherwise inexplicable. The effect of wind in distributing plants on land is well known.

But in the case of animals also, winds are a more important means of transport than one might at first suppose. Birds and insects are often blown immense distances out of their course; and to this cause, for instance, is due the arrival almost every year of American bird waifs on the Bermudas. Insects blown from land have been caught on ships more than 300 m. from land. Further, there are well-authenticated cases of even crabs, frogs, and fishes carried long distances by storms; and in this way, it may be possible to account for the transference of fish, etc., from one river system to another. Still more frequent probably is such transport of the eggs of these creatures.

Next, marine currents are an important agency of dispersal for plants and animals, in various ways. First, seeds may float on the surface of the ocean, and be carried by currents for hundreds of miles, and become stranded on a distant shore still fit for germination. The well-known experiments of Darwin to determine the vitality of seeds in sea-water, first showed the importance of this factor in the distribution of plants. In one experiment, he found that of 87 kinds of seeds, 64 germinated after an immersion of 28 days, and a few survived an immersion of 137 days; and in another, that of 94 dried plants, 18 floated for above 28 days; and combining the results of the two experiments, he concluded that 14 plants out of every 100 in the flora of a country might be floated by currents moving at the average rate of the several Atlantic currents, a distance of 924 m. and might, on being stranded furnish seeds capable of germinating.—Further, marine currents often carry on their surface various kinds of natural rafts, which may be means of transport for plants and animals. In polar regions, icebergs and icefloes may serve this purpose; elsewhere, trunks of trees, and even fragments torn from the land. Such floating fragments, forming small islands with erect trees upon them, have been seen 100 m. from the mouth of the Ganges and other rivers. Mr. Wallace points out that ocean waifs of one kind or another are almost the only means we can imagine by which land-shells can have

acquired their remarkably wide distribution. These mollusks perish very readily in sea-water, but are very tenacious of life in other circumstances; and this tenacity of life favors their chance of being carried in chinks of floating timber, or otherwise, across the ocean.

Again, locomotive animals are very frequent agents in dispersing both plants and other animals. Seeds may be attached to the fleece or fur of mammals or the plumage of birds or may be inclosed in clumps of earth clinging to the feet, or some other part of bird or beast, even of insects. To Darwin we are again indebted for an instance showing how likely a mode of transport this is. He informs us that he received from Prof. Newton the leg of a red-legged partridge (*Caccabis rufa*) with a ball of hard earth weighing 6½ ounces adhering to it. The earth had been kept for three years; but when broken, watered, and covered by a bell glass, as many as 82 plants sprang from it. Hooked fruits, such as those of agrimony, gum, etc., and fruits covered with a viscous substance, like those of some thistles, mistletoe, and others, are the most likely to be transported in this way. It seems probable that aquatic birds and water-beetles have been the means of distributing aquatic plants and fresh-water mollusks, remarkable for their wide diffusion; and the spawn of amphibians and fresh-water fishes may be conveyed from one body of fresh water to another by the same means.

Again, seeds with hard shells are known in many cases to be capable of passing through the digestive organs of birds uninjured; consequently fruits inclosing such seeds, or, like the strawberry, covered with them, may be devoured by birds in one place, and deposited by them in a state fit for germination at another, hundreds of miles distant. And what is of still more importance, seeds which would be destroyed if they passed through the digestive organs of a bird, are quite uninjured as long as they remain in the crop, where they may be retained 12 to 18 hours; thus birds killed with food in their crop may be the means of scattering seed which has travelled 500 miles. It is obvious that the migratory habits of certain birds are of great importance with reference to both the means of transport just mentioned.

Further, the parasitic habits of certain animals, enable them to be carried about from place to place, when they have themselves no power, or only a very feeble power of locomotion. For the question now in hand, it is indifferent whether the animals are truly parasitic, feeding at the expense of the host to which they are attached; or merely commensalists, gaining their own food independently, like the sea-anemones frequently attached to the shells of hermit-crabs.

Lastly, man is often unintentionally the means of conveying both plants and animals from one region to another. The foreign plants found growing on ballast-heaps are instances of this, and so are the plants which sprung from seed introduced with imported grain or other articles of

import. Wherever European sailors have gone, the European rats, both black and brown, have accompanied them; and the shrew, the death's-head moth, etc., also are known to have been introduced into various countries in ships.

In the preceding summary of the more important means of diffusion for plants and animals, some of the obstacles to diffusion have been incidentally referred to; but it will be convenient to make a general survey of these also.

For all land-plants and land-animals, the most obvious and effective barrier is a wide expanse of ocean; and where the expanse is very wide, it is seldom passable except with the aid of man. For land mammals, the ocean is an absolutely impassable barrier; hence native mammals are always absent from oceanic islands (that is, islands that have never been connected with the mainland); and this barrier is almost equally effective for serpents and amphibians, which also are nearly always lacking where there are no native mammals. Lizards are more frequently found indigenous on oceanic islands, though their means of transit from the mainland is unknown. Arms of the sea and broad rivers likewise are generally impassable for the creatures mentioned, though some have greater powers of swimming than is generally supposed. The jaguar, the bear, and the bison, are capable of swimming the widest rivers; pigs have been known to swim ashore when carried several miles out to sea; and even a boa-constrictor is reported to have swum to the island of St. Vincent from the S. America coast—200 miles.

Next to perfect isolation, the most important restrictive influence is climate, and this is operative not only in widely separated regions, but as well in contiguous areas. Of the influences comprised under climate, the two most potent are temperature and humidity, and the effect of these is truly astonishing.

Mountains, especially high mountains, are frequently effective barriers to the migration of land plants and animals; but it must be noticed that in some cases they serve also as a means of communication between one area and another, enabling plants and animals belonging to a cold climate, for example, to spread into latitudes where, in the plains, the climate is too hot for them. Again, deserts act as a barrier to the majority of plants and animals; forests are a barrier to the camel, zebra, giraffe, etc.; treeless regions to apes, most lemurs, and many monkeys; wide plains to wild goats and sheep.

Another set of barriers may be classed under the general head of organic, inasmuch as they all are connected with the vegetable or animal life of the region where such barriers exist. Under this head is to be noted first the fact that certain animals require for their subsistence a special kind of vegetable food. The range of insects is peculiarly liable to be limited in this way, certain insects being attached to particular species of plants, and others to genera or families; and for this reason, insects, in spite of the

exceptional facilities for dispersal which they enjoy, are remarkable, as a rule, rather for the restriction than for the width, of their areas of distribution. Again, the presence of enemies is sufficient in some cases absolutely to exclude certain forms from certain areas, as the well-known tsetse fly excludes horses, dogs, and cattle from a well-defined area in s. Africa; and another kind of fly prevents horses and cattle from running wild in Paraguay, as they do in abundance both to the north and to the south of that region.

The barriers to the spread of marine creatures are not so numerous as in the case of terrestrial forms. The freedom of communication between one part of the ocean and another makes it more difficult to mark out marine zoogeographical regions, though many seas and coasts are distinguished by characteristic fishes and other marine creatures. The principal barriers for fish are temperature and the intervention of land. Thus, the Isthmus of Panama is a complete barrier for fishes requiring warm seas.

If all the barriers to migration had existed in all past time as they are now, it would be quite impossible to explain the present distribution of plants and animals on the supposition that kindred groups have had a common birthplace. But the solution of the problems of distribution is to be found in the fact that all the barriers are liable to change. Of changes of sea and land, geology supplies abundant evidence. Portions of the mainland now continuous were at one time severed by arms of the sea; and islands have been formed by the severance of portions of land that once belonged to the mainland. Such islands are known as continental islands, and the study of their faunas and floras is one of peculiar interest in connection with geographical distribution. These faunas and floras show, as might be expected, a greater or less correspondence with those of the mainland from which the islands have been cut off; and the resemblance is the closer, the more recently the land connection has been destroyed. The relative date of the disunion is usually approximately indicated by the depth of the sea which now separates island and mainland, shallow seas dividing portions of land that have only recently been disconnected, and deeper seas separating those which have been longer apart.

Of such continental islands, no better example could be given than the islands of Britain, a group separated by one of the shallowest of seas from the mainland of Europe, with which it was connected even in post-pliocene times. Both flora and fauna of these islands present, accordingly, a close correspondence with those of the neighboring parts of the mainland, being nearly what would be expected if the connection with the mainland still existed. The W. Indies are another interesting example of the same class of islands, but in this case the severance is of older date; and a still more interesting example is the island of Madagascar, the fauna and flora of which, while markedly peculiar, yet exhibit decided affinities with those of s.

Africa, and appear to indicate a former land connection of the island with the neighboring continent, but a connection at a remote period, when the flora and fauna of the latter were differently constituted from what they are at present.

A still more remarkable case of isolation is presented by the Australian region, the fauna and flora of which are the most peculiar in the world. In the widest sense, this region includes not only the vast island of Australia itself, but also New Guinea and all the Malayan and Pacific islands east of a deep channel between the islands of Bali and Lombok, a channel the significance of which, as a boundary line for plants and animals, was first pointed out by Mr. A. R. Wallace, the great authority on animal distribution; whence it is known as Wallace's Line. The great feature of this region (so far as animal distribution is concerned), is 'the almost total absence of all forms of mammalia which abound in the rest of the world, their place being taken by a great variety of marsupials.' The marsupials, though now restricted, as stated at the beginning of this article, were at one time spread over the whole world, but have in most parts become extinguished by the competition of later types; thus presenting one of the best examples of what are known as discontinuous areas of distribution, and offering an illustration of the mode in which such discontinuity is usually brought about. The early severance of the Australian region from the Asiatic continent (a severance which must be referred to some period in the Secondary Age of geologists), saved the Australian marsupials from the competition which almost extinguished the group elsewhere.

Turning to marine distribution, we find evidence of the former absence of a land-barrier at the Isthmus of Panama, in the identity of many species of fish on both sides of the isthmus.

Changes in the climatic barrier also have had an important influence on geographical distribution; and it is by such changes, combined with changes in the continuity of land in the n. polar regions, that the affinities between the floras of Japan and eastern N. America may be explained. When these affinities were first pointed out by Asa Gray, that distinguished botanist divined the true explanation—namely, that in former geological epochs, a genial climate must have prevailed even within the polar circle, so as to allow the existence of a remarkably uniform flora, suitable to such a climate, all round the pole in very high latitudes; and that as the climate became colder in the north, this flora was driven southward, and became differentiated according to the differences of climate in the latitudes to which it advanced. Hence the e. parts of America and Asia, as they largely correspond in climate, came to correspond more closely than other tracts in the same latitude in their floras also. The soundness of this surmise was afterward confirmed by the discovery of abundant plant remains of the Miocene age, indicating a warm climate in Greenland, Spitzbergen, and elsewhere. For the effects

on distribution, of the changes of climate belonging to this period known as the Ice Age, see GLACIER; GLACIAL PERIOD.

The present distribution of plants and animals is such as to enable us to divide the terrestrial surface of the globe into more or less defined regions. The regions adopted by Mr. Wallace, which were based on all kinds of animals, are nearly the same as those first suggested by Mr. Sclater as applicable to the distribution of birds alone; for in spite of the exceptional facility which birds have for crossing barriers impassable to mammals, the distribution of mammals (which afford one of the best means of marking off zoogeographical regions) corresponds with that of birds to a remarkable extent. But with regard to these regions, it must be remembered, first, that it is impossible in most cases to give them any clearly marked boundary; secondly, that the degree of divergence between different regions is different in different cases; thirdly, that when any two regions are compared, we have not the same degree of divergence between different groups of the animal kingdom, or between animals and plants belonging to the two regions. Obviously, the degree of correspondence depends largely on the facilities for dispersal, and largely also on the geological age of different groups; and both of these are varying factors. These considerations being premised, the following may be stated as the limits of the seven zoological regions of the world. For details of the characteristic life of the different regions, see works cited at the end of this article.

1. Arctic Region, comprising the circumpolar portions of Europe, Asia, and North America, south to the limit of trees; together with the summits of mountains above timber line in these three continents.

2. Palæarctic Region, comprising Europe and n. temperate Asia, north to the edge of the barren grounds, south to the Himalaya Mts. and the Hoang Ho river and north Africa to the n. borders of the Sahara.

3. Ethiopian Region, comprising all tropical and s. Africa; Madagascar and the Mascarene Islands; and Arabia.

4. Oriental Region, comprising all Asia s. of the Palæarctic limits; and the East India Islands as far as the Philippines, Borneo, and Java.

5. Australian Region, comprising Australia; with New Guinea and all the East India and Pacific islands e. of the deep channel between the islands of Bali and Lombok: Celebes might be referred with almost equal right to either this or the preceding region: New Zealand is a highly peculiar sub-region of this great region.

6. Nearctic Region, comprising all temperate N. America, north to the barren grounds, and south over the table-land of Mexico.

7. Neotropical Region, comprising South America, Central America, both coasts of Mexico, with all the West Indies.

GEOGRAPHICAL DISTRIBUTIONS, PLANTS, ETC.

The distribution of plants is so intimately connected with that of animals that it is at least unwise, if indeed not impossible, to disassociate the two when working out the life areas of the world. A comparatively recent work of Engler's is, however, of interest as showing the relationships of the ancient flora to the present zoogeographical areas, but his conclusions regarding the latter are apparently too much influenced by his geological history. He attempts to trace the history of the vegetable kingdom since the tertiary period (see references at end of article), and comes to the conclusion, that in the tertiary period four different 'floral elements' (*Florenelemente*) could already be distinguished, as follows:

1. The Arcto-tertiary element, characterized by an abundance of conifers and numerous genera of trees and shrubs now prevalent in N. America, or in extra-tropical e. Asia and in Europe.
2. The Palæotropical element, characterized by the presence of the families and sub-families dominant in the tropics of the old world; and still more by the absence of certain families, groups, and genera found in the territory of the Arcto-tertiary element.
3. The Neotropical or S. American element, which according to Engler, must have had in tertiary times much the same character as that now possessed by tropical Brazil and the W. Indies.
4. The old Oceanic element, consisting of forms which possessed the power of traversing considerable stretches of ocean and developing further on islands.

See P. L. Sclater's paper on the Geographical Distribution of Birds, in the *Jour. Linn. Soc.* (*Zool.*), II.; of his Address to the Biological Section of the Brit. Assoc. at Bristol, 1875; and his *Geographical Distribution of Mammals;* A. R. Wallace's *Geographical Distribution of Animals* (2 vols. Lond. 1876), his *Island Life* (Lond. 1880); A. Murray's *Geog. Distribution of Mammals* (Lond. 1866); Bentham's Presidental Address to the Linnean Soc., *Jour. Linn. Soc.*, X. (Botany, introd.); A. de Candolle's *Géographie Botanique* (2 vols., Paris 1855); Sir J. Hooker's *Introduction to the Flora of Tasmania*, and *Handbook of the Flora of New Zealand;* also a paper by him On the Distribution of Arctic Plants, *Trans. Linn. Soc.*, XXIII.; Grisebach's *Vegetation der Erde* (Leipzig 1872-78); and French version of the same with notes, by P. de Tchihatchef (2 vols., Paris 1875-78); Ad. Engler's *Entwickelungsgeschichte der Pflanzenwelt seit der Tertiärperiode* (2 vols., Leipzig 1879-82); Asa Gray's Forest Geography and Archæology, in *Amer. Jour. of Science and Arts*, ser. iii., XVI, (1875); Schmarda's *Die Geographische Verbreitung der Thiere* (3 vols., Vienna 1853); the article on *Geographical Distribution* in Alfred Newton's *Dictionary of Birds;* and the chapters on Geographical Distribution in Darwin's *Origin of Species*, as well as chapters xxxviii-xlii. of Lyell's *Principles of Geology.*

GEOGRAPHICAL SOCIETY OF PHILADELPHIA.

GEOGRAPHICAL SOCIETIES: associations formed with the view of obtaining and disseminating geographical knowledge. This is attained, in the first instance, by members undertaking distant travels, at their own expense in some cases, in others assisted by the funds of the society or grants from government; and, in the second instance, by lectures delivered and works issued under the auspices of the society, or by papers read and commented on at the periodical meetings. In point of seniority the first of these associations is the Société de Géographie of Paris, founded in 1821. The German Gesellschaft für Erdkunde held its first sittings in Berlin in 1828, under the presidency of Ritter, and has counted among its members many of the most famous of modern geographers. By far the most important of these institutions, however, is the Royal Geographical Society, established in London in 1830. The principal travelers and geographers of Great Britain, or indeed of the world, are or have been connected with this society. It issues a *Geographical Journal* in monthly parts, which includes the society's proceedings. It has a capital of $200,000, and large sums are devoted annually to aid the cause of geographical research, or as awards and recognition of services rendered to the science. The Russian Geographical Society, founded at St. Petersburg in 1845, has greatly extended our knowledge of Central Asia and Asiatic Russia. Following the lead of other nations, Italy has her Società Geografica, founded at Florence in 1867, and issuing an annual 'Bollettino.' The American Geographical Society was founded at New York in 1852. The Royal Scottish Geographical Society was founded in 1884. It publishes an excellent monthly magnazine, and its members number between 1,500 and 1,600. The Royal Geographical Society has a membership of between 3,000 and 4,000.

GEOGRAPHICAL SOCIETY, THE AMERICAN: a society established in 1852 to encourage geographical exploration and discovery and to disseminate new geographical information. The Society has about 1500 members.

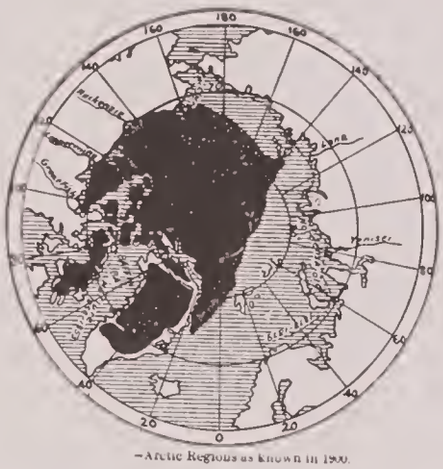
GEOGRAPHIC SOCIETY, THE NATIONAL: an American organization with headquarters at Washington, D. C. It was formed in 1888, and offers annual lecture courses in Washington upon popular geographical subjects. The *National Geographic Magazine* is published monthly by the Society, which has several thousands members.

GEOGRAPHICAL SOCIETY OF PHILADELPHIA was organized in 1891, and in 1893 a charter was granted to the Geographical Club of Philadelphia, of which Angelo Heilprin was the first president. The present title was resumed in 1897. The Society confers annually the Elisha Kent Kane gold medal, as a reward for geographical work. The Society has about 450 members.

—Africa as known in 1800. The darkened portions in this and succeeding maps show the unexplored areas

—Africa as known in 1900

—Arctic Regions as known in 1800



—Arctic Regions as known in 1900.

—North America as known in 1800

—North America as known in 1900.

GEOGRAPHY, n. *jē-ŏg′ră-fĭ* [F. géographie—from Gr. *gē*, the earth, and *graphē*, a writing or description]: a description of the surface of the earth, of its artificial divisions into countries, states, kingdoms, cities, towns, etc., and of its natural divisions into oceans, rivers, continents, islands, mountains, etc.; a book containing such description. GEOG′RAPHER, n. *-fer*, one versed in geography; a writer on the subject. GE′OGRAPH′IC, a. *-ō-grăf′ĭk*, and GE′OGRAPH′ICAL, a. *-ĭ-kăl*, of or relating to geography. GE′OGRAPH′ICALLY, ad. *-li*. Three divisions of the subject are commonly recognized: MATHEMATICAL GEOGRAPHY treats of the size, form, and planetary relations of the earth, also how to determine the position of places on its surface in relation to one another, as well as how to inscribe them on globes, maps, and charts. PHYSICAL GEOGRAPHY treats of the general surface-structure of the terrestrial globe, its varied climates and soils with their productions, the atmosphere by which it is surrounded, and the distribution of living beings on its surface. It also includes PHYSIOGRAPHIC GEOGRAPHY, which treats of the constant changes of the earth's surface, and the evolution of surface features—such as upheaval, depression; the form, action of mountains, plains and plateaus; the progressive development of rivers, lakes, coast forms, etc. POLITICAL GEOGRAPHY treats of the various artificial divisions of the earth's surface into empires, kingdoms, and republics, with their industries, and the social, civil, and religious conditions of each. It also includes COMMERCIAL GEOGRAPHY, which treats of the exchange of the various products of the earth among the people of the earth.

GEOG′RAPHY; science of the description of the earth, with its natural and its artificial divisions and products, and its various populations.

Mathematical or *Astronomical* Geography describes the earth in its planetary relations as a member of the solar system, influencing and influenced by other cosmical bodies. It treats of the figure, magnitude, and density of the earth; its motion, and the laws by which that motion is governed; together with the movements of the earth itself, or of other cosmical bodies, on which depend the alteration of day and night, the seasons of the year, and the eclipses of the sun, moon, and planets. It treats of the determination of position and distances on the earth's surface, of methods for the solution of astronomical problems, and of the construction of the instruments for such operations, together with the modes of representing the surface of the earth by means of globes and maps. For the numerous subjects comprised in this portion of geographical science, see such titles as ASTRONOMY; LATITUDE AND LONGITUDE; MAPS; MATHEMATICAL INSTRUMENTS; OBSERVATORIES, etc.

Physical Geography considers the earth in its rela-

tion to physical laws only. It describes the earth, air, and water, their reaction upon one another, and the various effects on the surface forms produced by such reaction. It also treats of the distribution of organized beings, whether animal or vegetable, and considers the history, extent, mode, and causes of their distribution. This is regarded as the most important branch of geographical science, since it involves study of phenomena which not only tends to further the material interest of man, but also conduces intellectual advance by stimulating the faculties of observation, and exercising the powers of thought. The sphere of inquiry included in physical geography embraces the consideration of all the earth sciences; see such titles as CLIMATE; HEAT; LAKES; RIVERS; MOUNTAINS; OCEAN; RAINS; CLOUDS; METEOROLOGY; ETHNOLOGY; DISTRIBUTION OF PLANTS AND ANIMALS.

Political.—Geography 'includes those facts which are immediate consequences of the operations of man on the raw materials of the earth, or on the means of his intercourse with his fellow creatures.' It embraces the description of the divisions and limits of empires, kingdoms, and states; and also the laws, government, and social organization which prevail in the several countries. For details of this branch of geography see the titles COUNTRIES, CITIES, etc.: for more general information, see the various historical, political, and statistical sources, especially *The Statesman's Year Book* and the *Almanach de Gotha.*

Geographical Discovery.—The earliest idea formed of the earth by peoples in a primeval condition seems to be that it was a flat surface, surrounded on all sides by the ocean, and covered by the heavens as a canopy; in the centre of the surface their own land was supposed to be situated. The Phœnicians are thought to have been the first people to communicate to other peoples a knowledge of distant lands. Before the age of Homer, the Phœnicians navigated all parts of the Euxine, or Black Sea, and had penetrated beyond the limits of the Meditarranean into the western ocean, as far as the Ultima Thule (Iceland). These voyages form the first link of the great chain of discovery, which, 2,500 years after their foundation of Tartessus, a colony in Spain, and Utica, a city in Africa, near Tunis, was carried by Columbus to the remote shores of America. Besides the settlements nearer home, these bold adventurers founded colonies in Asia Minor about B.C. 1200, and a century later they laid the foundation of Gades and Utica. During the 9th c. Carthage was founded and new streams of colonization continued to flow to unknown parts of the world. The Phœnicians, though less highly gifted than the Egyptians, rank next to them in regard to the influence which they exerted on the progress of civilization; their knowledge of mechan-

ics, their use of weights and measures, and, still more important, their employment of an alphabetical form of writing, facilitated commercial intercourse among their own colonies. There was a rapid advance of geographical knowledge between the age of the Homeric poems and the time of Hesiod (B.C., 800). In the former the earth is supposed to resemble a circular shield, surrounded by the great river Oceanus. The continental names were restricted to Libya, Europe, and Asia. The first named applied to the valley of the Nile and the nearby coast; the second to the country about the Danube and the Mediterranean and Black Seas. During the 7th c., B.C., Phœnician explorers under the patronage of Neco II., King of Egypt, undertook a voyage of discovery, and, it is alleged, circumnavigated Africa. This expedition is recorded by Herodotus, who relates that it entered the southern ocean by way of the Red Sea, and after three years' absence, returned to Egypt by the Pillars of Hercules. The fact of an actual circumnavigation of the African continent was doubted by Herodotus, but proof of its reality is afforded by the observation 'that the mariners who sailed round Libya (from e. to w.) had the sun on their right hand.' From the fact that Neco ordered the expedition to sail around Libya and return by way of the straits of Gibralter, it may be assumed that the peninsular form of Africa was known at that time. The 7th and 6th c., B.C., were memorable for great advance in knowledge of the form and extent of the earth. Thales, and his pupil Anaximander, reputed to have been the first to draw maps, paved the way for attainment of a sounder knowledge. Other geographers contributed at this period to the same end by the descriptions which they gave to various parts of the earth; of these, perhaps the most interesting to us is the narrative of the Carthaginian Himilco, who discovered the British Islands, which he described as being a four months' voyage from Tartessus.

With Herodotus (b. B.C. 484), who may be regarded as the father of geography as well as of history, a new era began in regard to geographical knowledge. He has so minutely described the countries which he visited in his travels (which covered an area of more than 31° or 1,700 m. from e. to w., and 24° or 1,660 m. from n. to s.), that his history gives us a complete representation of all that was known of the earth's surface in his age. According to the belief of that time, the world was bounded s. by the Red Sea or Indian Ocean, and w. by the Atlantic, while its e. boundaries were conjectured to be nearly identical with the limits of the Persian empire, and its n. termination somewhere among the Hyperboreans, in the region of the amberlands of the Baltic, which had been visited by Phœnician mariners, and with which the people of Massilia (modern Marseille) had in-

tercourse by way of Gaul and Germany. In the next century the achievements of Alexander the Great materially enlarged the bounds of knowledge; for while he carried his arms to the Indus and Oxus, he promoted science by exploring and surveying the various provinces which he subdued. Hence the victories of the Macedonian conqueror formed a new era in geographical discovery.

While Alexander was opening the East to the knowledge of western nations, Pytheas, an adventurous navigator of Massilia, conducted an expedition past Spain and Gaul through the English Channel, into the northern ocean, where after six days' sailing, he reached the Ultima Thule (conjectured to be Iceland). Returning, he passed into the Baltic where he learned of the Teutons and Goths. Discovery was thus being extended in the north and east into regions whose very existence had never been suspected, or which had hitherto been regarded as mere chaotic wastes. An important advance in geography was made by Eratosthenes (b. B.C. 276), who first used meridians of longitude and parallels of latitude, in order to construct maps on mathematical principles. Though much of his work in geography is lost, we learn from Strabo that he considered the world to be a sphere revolving with its surrounding atmosphere on one and the same axis and having one centre. He computed its circumference to be 25,200 geographical miles, and the inclination of the axis to be 23° 51′. He believed that only about one-eighth of the earth's surface was inhabited, while the extreme points of his habitable world were Thule in the n., China in the e., the Cinnamon Coast of Africa in the s., and Cape St. Vincent in the w. During the interval between the ages of Eratosthenes and Strabo (b. B.C. 60), many voluminous works on geography were complied, which have been either lost or only in part preserved. Strabo's great work on geography, composed when he was 80 years of age, is considered a model of what such works should be in regard to the methods of treating the subject. But while his descriptions of the places that he visited are interesting and instructive, he seems to have discarded the work of preceding writers.

The wars and conquests of the Romans had a most important bearing upon geography, since the practical methods of the Roman people led them to study the resources of every province brought under their sway. Great service was done to geographical knowledge by the survey of the empire, begun by Julius Cæsar and completed by Augustus. This work comprised a description and measurement of every province by the most celebrated geometricians of the day. Pliny (b. A.D. 23), who travelled in Spain, Gaul, Germany, and Africa, left a compendium of the geographical and physical science of the age in the four books of his

Historia Naturalis. He collected the information contained in the works of Sallust, Cæsar, Tacitus, and others, and to them added the results of his own observations. Since Cæsar's time the progress in geographical knowledge is evidenced by Pliny's notice of the arctic regions and the Scandinavian lands. Pliny also gives accounts of Mount Atlas, the course of the Niger, and of various settlements in different parts of Africa. His knowledge of Asia is more nearly correct than that of his predecessors. The study of geography in ancient times may be said to have terminated with C. Ptolemy, in the middle of the 2d c. of our era. Ptolemy's work on Geography, in eight books was the most comprehensive treatise during the dark and middle ages; but it added little to the knowledge of n. Europe or the extreme boundaries of Asia and Africa. From this time till the 14th c., when the records of the travels of the Venetian Marco Polo opened new fields of inquiry, the statements of Ptolemy were never questioned, and even during the 15th c. it was only among a few German scholars at Nürnberg that the strange accounts by the Venetian traveller of distant eastern lands were received as trustworthy where he differed from Ptolemy. Marco Polo had, however, unfortunately made no astronomical observations, nor had he even recorded the length of the day at any place. The Nürnberg geographers, having no trustworthy data for estimating the extent of the countries which Marco Polo had traversed, fell into errors leading to results that influenced the history of mankind. Taking Ptolemy's tables as their basis, they incorporated on their globes and maps the results of their own estimates of the length of Marco Polo's days' journeys, and thus represented the continent of Asia as extending across the Pacific, its eastern shores being somewhat in the region of Antilles. These erroneous calculations misled Christopher Columbus to the conclusion that by sailing 120° w. he would reach the trading marts of China; the result of this conviction was that memorable expedition which terminated in the discovery (1492) of America. Although there is no reason to doubt that the American continent was visited in the 9th and 10th c. by Northmen, who for 11 years had a lumber camp at Vinland (an unknown locality probably on the New England coast), the event remained without influence on the history of discovery. This momentous discovery of Columbus which had been preceded by the exploration of the African coast and the rounding of the Cape of Good Hope by Vasco da Gama (1497) was followed by a rapid succession of discoveries; and within 30 years of the date of the first voyage of Columbus, the whole coast of America from Greenland to Cape Horn had been explored, the Pacific Ocean had been navigated, and the world circumnavigated by the surviving ship of

Magellan (q.v.). The coasts of eastern Africa, Arabia, Persia, and India had been visited by the Portugese, and numerous islands in the Indian Ocean discovered. The 16th c. was marked by continued attempts to extend the sphere of oceanic discovery. The desire to reach India by a shorter route than that of the Cape of Good Hope or Cape Horn, led to many attempts to discover a northwest passage. These, though they signally failed in their object, had the effect of materially enlarging the knowledge of the arctic regions. The expeditions of Willoughby and Frobisher (1553 and 76), of Davis (1585), Hudson (1607), and Baffin (1616), were the most important in their results toward this end. The 17th and 18th c. gave a new drift to the study of geography by bringing other sciences to bear upon it. Among these may be mentioned the use of the Mercator chart, on which a straight line closely corresponded to the arc of a great circle; the quadrant, afterward modified to the sextant which gave the sailing master an artificial horizon; the perfection of the chronometer, still later, made the determination of longitude at sea an easy matter. In the 17th c. the Dutch, under Tasman and Van Diemen, made the Australasian islands known to the civilized world. In the latter half of the 18th c. Capt. Cook extended the great oceanic explorations by the discovery of New Zealand and many of the Polynesian groups. The antartic continent was visited first in 1840 by American, English, and French expeditions under their respective commanders Wilkes, Ross, and Dumont d'Urville. Polar exploration, after having been for a time in abeyance, has within late years been vigorously prosecuted by the U. S. and various European countries. Markham and Nares, Lockwood and Brainard, Nansen and Abruzzi each in turn broke the record of 'farthest north' until Peary, in 1909, reached the pole. Meanwhile the antarctic regions have not been neglected. Sir Ernest Shackelton and the *Nimrod* expedition succeeded, Oct. 1908, in attaining 88° 23′ s. lat. The party located the s. mag. pole. Much remains to be done in regard to special districts of Central and S. America. In Asia, numerous travellers, geographers, and naturalists have contributed to render our knowledge precise and certain in respect to a great part of the continent. In recent times the work of Sven Hedin and Dr. Stein is noteworthy. A debt of gratitude is due to Jesuit missionaries, whose indefatigable zeal has furnished us with a rich mass of information in regard to minor details in Asiatic life and nature. In Africa, the combined influences of climate and religious hostility to European advance have retarded explorations into the interior; nevertheless, much light has been thrown on the character and condition of the African continent by many of its great explorers—as Bruce, Park, Clapperton, Adanson, the

Landers, Burton, Speke, Barth, Vogel, Livingstone, Cameron, and Stanley. In Australia, though much remains to be done, the obscurity which had hung over the interior has been to a great extent removed by the explorations of Sturt, Eyre, Leichhardt, and the brothers Ghegory; and still more by the highly important labors of Burke and Willis, who in 1860 crossed the Australian continent from Melbourne to Carpentaria. Giles, Warburton, and Forrest forced their way in nearly parallel lines to the w. coast. The labors of these and other explorers prove that about half of the continent of Australia is covered with dense growths of spinifex, acacia, and eucalyptus, and is not habitable.

The progress of recent discovery has been aided by the encouragement given to exploration by the governments of different countries, and by the efforts of the numerous geographical societies (of which there were about 100 at the close of the 19th c.). The constantly increasing mass of information collected by scientific explorers is rapidly diffusing correct information in regard to distant regions, but there still remain unexplored regions in N. America, and still larger areas in S. America, Asia, and Africa. On the subject of geographical discovery, see the following works: Bunbury's *History of Ancient Geography* (1880); Kiepert's *Manual of Ancient Geography* (1881); *Précis de Géographie Universelle*, by Malte Brun; *Humboldt's Hist. crit. de l'Hist. de la Géographie*, and the *Cosmos;* Ritter's *Asien;* Kloeden's *Erdkunde;* Reclus, *Nouvelle Geographie Universelle* (5 vols.), Stanford's *Compendium of Geography and Travel*, based on Hellwald (6 vols.). The recent progress of geographical discovery may be traced in Petermann's *Mittheilungen*, the *Geographical Journal* (the organ of the Royal Geographical Soc.), and the official publications of the Scottish and National (U.S.A.) geographical societies.

GEOG'RAPHY, Medical: branch of medical science dealing with the liability of particular localities to become the centres of special diseases or groups of diseases. This liability has been observed from the ancient periods, as we have excellent evidence in the Hippocratic treatise, *On Airs, Waters, and Places*, one of the undoubtedly genuine works of the great Greek physician, and one of those which best sustains his traditional reputation. In recent years medical geography has become a most elaborate and carefully investigated branch of medical science, the details of which, though of considerable popular interest, are very complicated and technical. Generally, the tropics are subject to diarrheal diseases, with acute affections of the liver, and severe remittent or pestilential fevers; in temperate climates we find malaria and diarrhea, especially during the summer and autumn, in low-lying, ill-drained localities. Temperate climates are subject in a peculiar degree to pulmonary affections and to the infectious diseases. Certain diseases as goitre, leprosy,

and some animal parasites have no relation to climate, but are found to affect, more or less exclusively, certain well-defined districts of country.

GEOLATRY, n. *jē-ŏl′ă-trĭ* [Gr. *gē*, the earth; *latreia*, worship]: the worship of terrestrial objects.

GEOLOG′ICAL SOCIETY OF AMERICA, an association of geologists organized in 1888. It was the outgrowth of the geological section of the American Association for the Advancement of Science. The society has a restricted membership of 300. A quarterly bulletin is issued under its auspices.

GEOLOGICAL SURVEY, United States, a bureau of the Interior Department, created for the purpose of examining the geological structure, mineral resources and products of the country, classifying the public lands, and preparing a map of the United States showing the results of its labors. At a more recent date the duties of investigating the extent to which the arid lands of the West can be redeemed by irrigation, the segregation of the irrigable from the non-irrigable lands, and the selection of sites for reservoirs and canals for purposes of irrigation, have been added. In carrying out this great work the survey has been divided into three branches: (1) Geology proper; (2) Topography; (3) Irrigation Surveys. The geological branch investigates the stratigraphy, the geological structure and history, the lithology, mineralogy, and palæontology, the ores and mines, and in general the natural economics, resources, and physical geography of the country. The topographic branch prepares the maps; the irrigation branch investigates the possibilities of irrigation and selects the irrigable lands and sites available for reservoirs and canals. The work of the topographic branch is the basis of the work of the other two, and all the results of the latter are projected on the maps. The publications of the survey are: (1) The annual report of the director, which, besides the administrative report, contains memoirs on geologic subjects by members of the survey, and is distributed according to the regulations of the Interior Department: (2) monographs on the leading subjects of special investigation by the geologists; (3) bulletins on more limited special subjects of research; (4) an annual volume of mineral statistics. The last three are distributed gratuitously only to designated libraries and to learned corporate societies, which send their own publications in exchange. Otherwise they are sold by the director and the money deposited in the treasury.

GEOLOGY, n. *jĕ-ŏl′ŏ-jĭ* [From Gr. γη the earth; λο′γος a discourse: F. *géologié*]: the science which treats of the present and past condition of the earth. GE′OLOG′IC, a. *-ō-lŏg′ĭc*, GEOLOG′ICAL, pertaining to geology. GEOL′OGIST, n. *ŏl-o-jĭst*, one versed in the science of geology. GEOL′OGIZE, v. *jīz*, to pursue the subject of geology. GEOL′OGIZING, imp. GEOL′OGIZED, pp. *jīzd*.

GEOLOGY.

GEOLOGY: science of the earth. It includes a study of: (a) the materials which constitute the world; *geognosy*. (b) The structure of the globe; *structural geology*. (c) Its surface features; *physiographic geology*. (d) The forces which change the structure, surface features and composition; *dynamical geology*. (e) The remains of the animal and vegetable life of preceding ages which have been preserved in the rocks; *paleontological geology*, or *palæontology*. (f) The history of the successive stages through which the earth has passed from its earliest beginning to the present times; *historical geology*. (g) The origin, occurrences and properties of the minerals and rocks useful to man; *economic geology*.

Thus the science embodies all phases of the present and past condition of the earth and is so broad as to require the assistance of many other sciences—especially astronomy, chemistry, physics, botany, zoology, and archæology.

GEOGNOSY.—Beginning with a study of materials it is to be noted that the earth may be divided into three zones or spheres, the *atmosphere*, *hydrosphere*, and *lithosphere*. The atmosphere consists chiefly of nitrogen (79 per cent.) and oxygen (nearly 21 per cent.), Besides these there are small quantities of carbon dioxide (.03 per cent.), rare gases, and varying amounts of water vapor.

At the sea level the atmosphere presses upon the earth's surface with a pressure of about 15 pounds to the sq. inch. The farther from the earth one goes the lower the pressure. The upper border of the atmosphere is probably at the limit of the earth's gravitation, more than 600,000 miles from the earth. There the pressure is so nearly zero that as the air molecules bombarding each other rebound, they may fly beyond the attraction of the earth and become lost in space.

The atmosphere exerts a powerful influence conserving or changing the earth's surface. As a thermal blanket it prevents the sun's rays from burning by day and the cold of space from freezing by night. It makes possible winds and rains which are such active geologic agents in transforming the surface of the lithosphere.

The hydrosphere is made up chiefly of lakes, seas and oceans, which comprise 72 per cent. of the earth's surface. If the earth were without heights and depressions the water would cover it in a layer about 10,000 ft. thick. As it is, the water is gathered into basins some of them as deep as 30,000 ft. 4 per cent. of the oceans' basins are between 18,000 and 30,000 ft. deep; 53 per cent. are from 12,000 to 18,000; 20 per cent. are between 6,000 and 12,000; and the remainder are less than 6,000 ft. in depth.

In addition to the waters visible on the surface, at a certain depth all rock is permeated with water. The place which marks the top of the permanent water is called the *water line*. It varies with the character, structure and location of the rock. So universal is the presence of these underground waters as to necessitate **even**

more than would the lakes and oceans the term hydrosphere.

As a geologic agent water exerts a most profound influence on the earth—the lithosphere. As rain it beats upon the ground, brings some materials to it and washes away others. In rivers it corrades portions of the country, transports materials and deposits them in another place. In lakes and oceans its waves beat away some coasts and bury others, thus changing the outlines of continents.

Water is one of the two great agents in the formation of the rocks which constitute the lithosphere. The other agent is heat.

The lithosphere forms the chief mass of the earth. The hydrosphere constitutes about $\frac{1}{4540}$ part and the atmosphere $\frac{1}{1200000}$ only. The lithosphere measures 7926.5 miles in its greatest diameter and 24,902 miles in its greater circumference. Its average specific gravity is 5.57.

As its name indicates it is composed of rock. Rocks (q.v.) are composed of minerals and minerals of chemical elements. Of about eighty elements five are so abundant as to constitute practically the whole earth. Together they amount to 91 per cent. They are oxygen, 47 per cent.; silicon 28 per cent.; aluminum 8 per cent.; iron 5 per cent.; and calcium 3 per cent. These and a dozen other abundant elements unite to form minerals which constitute the lithosphere.

Minerals are the physical units of the world. There are about 1000 different kinds known. But of these less than one tenth are abundant enough to demand the attention of the geologist and if he have acquaintance with about a dozen of them he will have enough to begin geologic work. For further information see MINERALOGY.

The most abundant mineral is quartz (q.v.) an oxide of silicon (SiO_2) which exhibits long six-sided crystals (hexagonal). It is transparent and colorless when pure. Often iron, manganese or titanium oxides give it a reddish, purple, or brown color. It is the hardest of common minerals (H.=7); is light in weight (Sp. G. =2.5); and does not split (cleave) but exhibits conchoidal surface when fractured. It is most commonly seen as sand, gravel, sandstone, quartzite or as a constituent of rocks that have been melted—the granites, etc. Chert, flint, agate, carnelian and onyx are well known forms of the chemically related chalcedony. Because of its hardness and indestructibility quartz does not form good soil. It is useful in its beautiful varieties as a gem and in its abundant forms as a building and abrasive material.

The minerals second in abundance are those which constitute the feldspars. Chemically they are not so simple as quartz. They are aluminum silicates of potassium, sodium and calcium. Their crystals are long prisms flattened laterally and with top and bottom sloping in one direction (orthoclase, a monoclinic crystal) or in two

1. Upturned Triassic Sandstone, Garden of the Gods, Colorado.
Photo by J. C. Pierson.
2. Archaean Rocks cut through by Colorado River, Grand Cañon, Arizona.
(Photo by A. R. Crook.)

directions (plagioclase, a triclinic crystal). Unlike quartz the feldspars split (cleave) easily in two directions. They are light in color, 6 in hardness and 2.5—3 in specific gravity. Feldspars make the mountains. They are the most abundant minerals in igneous and metamorphic rocks—the rocks that are characteristic of mountain ranges. Feldspar decomposes readily and forms good soils. It is the source of kaolin and the clays so useful in the manufacture of brick, tile and cement.

The third mineral in abundance is calcite. It, too, is a light-colored mineral, softer than either of the others named (H.=3) and of about the same weight (Sp. G.= 2.7). Its crystals are three or six sided and split with extreme ease into three-sided figures (rhombohedrons) which resemble distorted cubes. Chemically calcite is a carbonate of calcium. Fine crystals exhibit great beauty. Calcite in fragmental condition constitutes limestone—one of the most widely spread and useful building stones. Limestone which has been metamorphosed forms marble.

After these three most abundant minerals, all of which are light in color, should be mentioned as the next in importance in rock building, three which are often black. They are the amphibole, pyroxene and mica groups. The first two groups resemble each other in appearance and constitution. They are silicates of magnesium, calcium and iron chiefly. They differ in their crystallization. While the most plentiful varieties of each are monoclinic (see CRYSTALLOGRAPHY) the amphiboles cleave parallel to prism planes enclosing an angle of 124 degrees, the pyroxenes exhibit an angle of but 87 degrees. Some of the commonest amphiboles are called tremolite, actinolite and hornblende and the chief pyroxenes are diopside and augite. Hornblende and augite are coal black, stocky crystals about 5.5 in hardness and 3.3 in specific gravity.

Mica is an elastic, soft (H.=2.5), light, (Sp. G.=2.8), white or black mineral, easily cleaved into thin sheets and crystallizing in the monoclinic system. Amphibole, pyroxene or mica occur in nearly every igneous and metamorphic rock and they together with quartz and feldspar practically build the mountain ranges.

Thus rocks are made up of minerals and in turn constitute the lithosphere. There are three kinds of rocks:—First, those deposited by wind or water—the *sedimentaries*, for example, sands, sandstones, limestones, clays and shales. Second, those formed from a fused mass—the *igneous rocks*, for example, granite, syenite, gabbro, diorite, porphyry, rhyolite, andesite and basalt. Third, those formed by the change or metamorphosis of the above named—the *metamorphic rocks*, for example, gneiss, schists, slate and marble.

STRUCTURAL GEOLOGY.—Knowledge of the structure of the earth is largely limited to the outer layer or crust. Of the interior little is known. However, judging from deep borings, hot springs, volcanoes and certain astrophysical facts the interior of the earth is intensely hot

but not molten as was formerly supposed. If molten, it would not have a rigidity between that of glass and steel as it does but would be so plastic as to be distorted by the attraction of the moon.

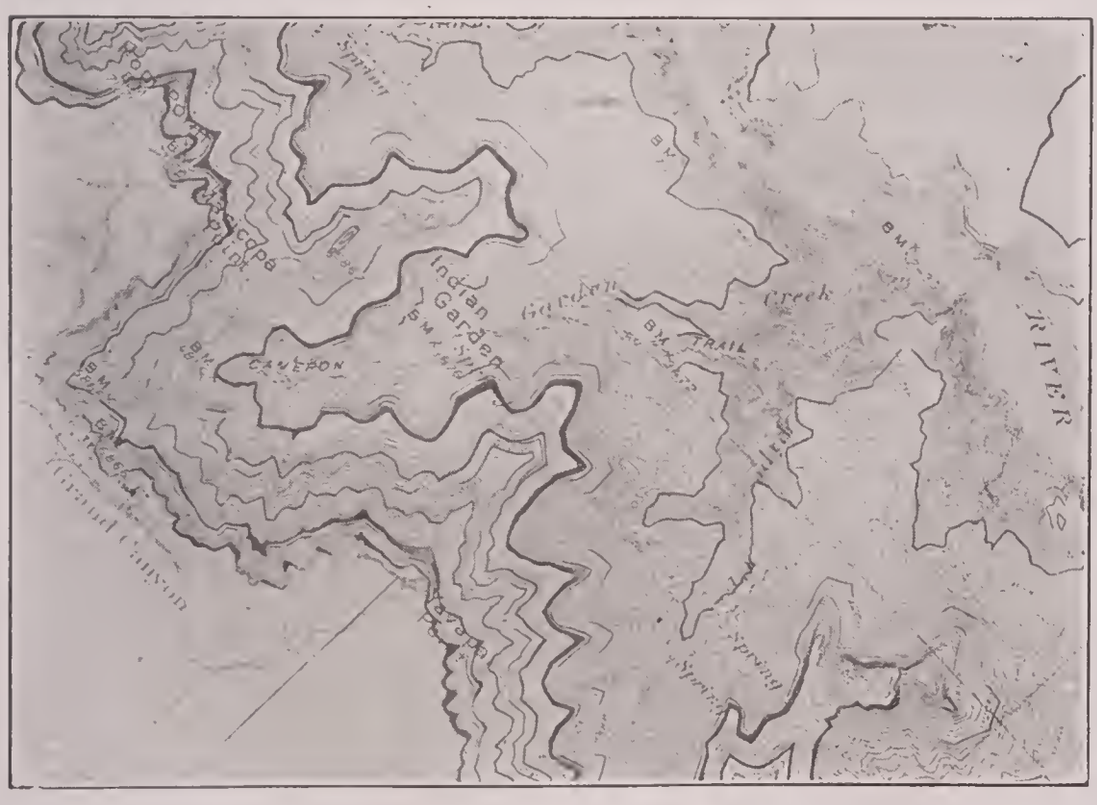
Outside of this central mass is a layer of rock many miles thick, which forms the chief part of the so called crust. It is usually covered by a layer of unconsolidated materials from a few to several hundred feet in thickness. These outer layers have been subjected to much investigation. Different rock strata whose total height, were they horizontal, would exceed 160,000 feet, have been named and described. Their minute texture and large structure have been well studied.

Sedimentary rocks have been laid down in layers or strata and are hence named *stratified rocks.* If the layers are very fine they are called laminæ, if thick they may form massive beds. The change in the layers is due to elevation or depression of the bed whereby finer or coarser material, or debris from other sources, are brought for deposition. A coarse sandstone may be followed by a fine sandstone, or a limestone layer by one of shale. Several strata lying on and followed by rock of markedly different character constitute a *formation. Cross bedding* is a special case where one series of laminæ are inclined to those above or below as if tilted after deposition, while in reality the inclination is due to the manner of deposition—the different laminæ having been formed by sand washed or blown over the edge of a terrace thus acquiring an inclination originally.

The aqueous origin of some sedimentaries is ofttimes well illustrated by preservation of ripple marks made in the original sand or clay deposit. This beautifully marked surface was buried under soft material, turned to stone and afterward exposed by the breaking away of the covering layer.

Concretions are aggregations of materials of one kind in a rock of a different kind. For instance, concretions of marcasite, sphalarite, and galena often form in clay. Irregular nodules of siderite and calcite are common in sands and mud, and similar masses of chert or flint are found in limestone. These foreign masses are sometimes bizarre in form and sometimes of surprising regularity, representing discs or almost perfect spheres. They vary in size from minute particles to balls the height of a man and masses still larger.

Igneous rocks (q.v.) lack stratification but show jointing, parting, flow structure and other architectural features characteristic of themselves. The joints are due to contraction of the mass because of cooling. They are planes of weakness along which water and frost can act to accomplish disintegration of the rock. Quarrymen take advantage of joint planes in breaking out blocks. At times the partings in the igneous rock are numerous and regular, and thereby symmetrical hexagonal columns are produced such as those which are so well shown in the



1. View on Cameron Trail, Grand Cañon, Arizona.
(Photo by A. R. Crook.)
2. Topographic Map of same locality made by U. S. Geological Survey.

Giant's Causeway, on the northern coast of Ireland, and in Obsidian Cliff, in the Yellowstone National Park.

Metamorphic rocks often retain the structure which marked the original rock from which they are derived and often they obtain new planes of separation due to recrystallization of their component minerals or to pressure at right angles to original bedding—as the *cleavage* of slate.

All rocks are subject to structural disarrangement. Originally horizontal strata may be raised at some point so as to *dip* or incline downward from that point. The horizontal direction across the country of the outcropping tilted rock is called its *strike*. The strike is at right angles to the dip. If the dip is in one long incline, the other side for instance having dropped down or been worn away, a *monocline* results. Two monoclines touching at their highest point and dipping away form an *anticline*. When dipping towards each other and touching at their lowest level they form a *syncline*.

In the disturbance of strata one block is often raised or lowered past a neighboring block. This slipping produces a *fault*.

Physiographic Geology deals with the various forms of the earth's surface—the ocean bottom; the peninsulas, capes, islands; the plains, terraces, plateaus, and mountains; and the manner in which they are affected by the action of moving water, by ice, by the atmosphere, by volcanoes, and by the forces which raise and lower the crust. In other words topographic detail and the forces which affect it are considered. Thus, this branch of the subject overlaps two succeeding divisions—dynamic and historical geology. Topographic forms are best studied and described by the aid of topographic maps of which there have been various kinds.

In the maps made by the U. S. Geological Survey, different elevations above sea-level are indicated by brown lines connecting points of the same level.

In rough country like the Grand Canon of the Colorado region these lines connecting points of equal elevation, called *contour lines* are drawn to represent a difference of 250 ft. in elevation, while in flat districts like the Mississippi delta or the Great Dismal Swamp, a contour line is drawn for every 5 ft. of elevation. The thicker the lines in a given place upon a map the steeper the slope.

Water features, such as rivers and lakes are represented in blue. Cultural features—towns, buildings, roads—are printed in black.

Dynamical Geology.—Physiographic and structural features are the result of forces which have been and are working upon the lithosphere. These forces are of four different kinds—atmospheric, aqueous, igneous, and organic.

The wind is able to take up and carry dust in great quantities for long distances. In the winter of 1896 Chicago was showered with a dust storm which darkened the afternoon sun, covered the newly fallen snow with a

black mantle and formed drifts an inch deep on porches and roofs.

Because of the microscopic character of the dust, the direction and force of the wind, and the territory over which the dust was deposited, it was concluded that the dust came from the Missouri river valley region in Nebraska six hundred miles away.

At the explosion of Krakatoa in 1883, volcanic dust hurled thousands of feet into the air was caught up by the wind and carried entirely around the world, some of the dust making the circuit in 15 days.

In many parts of the world, for example in Iowa and the Dakotas and other states in the Missouri-Mississippi region are massive deposits composed of extremely fine earth. They possess to a remarkable degree the power of retaining their shape so that wells or ditches dug through them, for a long time preserve upright walls. They are composed chiefly of silicious and calcareous materials, are called *loess* and are largely *œolian*, i.e., wind deposits.

In sandy regions exposed to strong winds vast quantities of sand are transported by the wind, which removes the sand layer by layer, without lifting it high in the air. In this manner mounds or ridges, often several hundred feet high are formed. They are called *dunes*. They may travel many miles across the country burying forests and towns. In 1800 a dune formed by a church on the shore of the Baltic in Germany (Kurische Nehrung). By 1839 it had completely buried the church. In 1869 it had migrated farther landward and uncovered the church. The sands of the Sahara encroach upon Egypt. On the southern and eastern shore of Lake Michigan sand dunes of 200 to 300 ft. in height, shifting their position, kill forests and uncover them again. In arid southeastern Texas enormous dunes have traveled hundreds of miles exhibiting this transporting power of the wind upon a gigantic scale.

The wind also produces other effects such as abrasion by swiftly driven sand, tearing up of soil by overthrown vegetation, oxidation, carbonation, hydration, desiccation, etc.

Among the aqueous agencies, rains, rivers, oceans, glaciers and chemical solutions are the chief. Rain falling upon the earth, by the force of the blow loosens the fine dust covering, and brings down to the ground from the air nitrogen, oxygen and carbon dioxide which have a chemical effect upon the soil. If rain is heavy some runs over the surface accomplishing *sheet erosion* before the water unites in rills to join a stream. Other portions are absorbed by the ground to eventually evaporate or join underground streams. The water forming a rivulet carries a burden of earth in which there is sand. The sand acts as a cutting instrument and the rivulet, grown to a stream, quickly washes out a gully. By the growth of the gully a valley is formed. At first it is V shaped.

And so when such a level has been reached that the stream is slow it meanders from side to side forming a U shaped valley. This process is repeated by side streams and the whole country is lowered. In their *youth* streams run swiftly and deepen their channels. In *maturity* they work equally at deepening and broadening the river bed. In *old age* their current is sluggish and deposition takes place more commonly than does erosion. Finally death ensues and the cycle of erosion is complete.

The topography of a region depends upon the amount of rain-fall, the stage of erosion, and the structural features such as unequal hardness of the rock, elevation and position of the strata, and presence of joints and folds.

The materials washed from the land by rivers are carried to the oceans and if it were not for other forces at work the continents would in time be cut down to sea level. Different formations have been *graded* in previous geological ages until they have become nearly a complete plain (peneplain).

Glaciers (q.v.) have had a marked influence upon the surface of the earth. When snow falls upon mountain tops or in polar regions a portion only may melt or evaporate. The rest remains to be buried under other snow until the weight grows so great that the individual flakes become granular forming 'nevé' or 'firn' ice and finally crystallize into the solid ice which constitutes a glacier. The whole mass is crowded downward by the force of gravity, and by the melting and freezing of the individual granules. Its movement is different from that of a viscous mass like lava or a fluid mass like that of a river. It is the flow of a rigid body in the bottom of which rocks are often embedded and so firmly held that they can scratch and groove the strata over which they are carried. Long continued glacial action produces U shaped valleys and rounded surfaces.

Glaciers carry great masses of rock debris which fall upon their surfaces or are frozen into their bottoms and are able to transport them long distances. Upon melting they deposit the debris in circular mounds at right angles to their length (terminal moraines) or in winding hillocks parallel to their length (lateral moraines). Streams flowing from under the glaciers, heavily laden with rock debris, often deposit their load in long winding hillocks called *eskers*.

Morainal deposits differ from river or ocean deposits in being less well assorted, large and small rocks being thrown down promiscuously. Their materials are subangular and often show glacial scratchings, or *striæ*. At present glaciers are confined to polar regions and mountainous districts. Among the latter are the Alpine glaciers which have been given especial study and stand as a type for all mountain glaciers. Greenland is covered under an *ice sheet* about 400,000 sq. miles in area, and Antarctica has an ice field more than 3,000,000 sq. miles in extent. These extensive fields picture the condition of the North

American continent during the glacial epoch when a continental sheet covered the major part of the country north of the Ohio and Missouri rivers with *glacial drift* and gave it its present topography.

The work of oceans upon the lithosphere is one of both degradation and aggradation because of the movements of the water. These movements result from at least five causes: First, from differences in density. The melting of vast quantities of ice in polar regions adding fresh water to the salt of the ocean makes it lighter than in regions where evaporation is rapid and addition of fresh water slight. Second, from differences of level. Great rivers bring enough water to the ocean to raise the level where they empty. The Amazon, for example, brings such quantities of water as to raise the ocean level at the river mouth and to start a movement which by means of the sediment can be traced hundreds of miles out to sea. The Ganges, the Congo, the Nile, and Mississippi have similar effect at their debouchers. Third, from movements caused by winds. Short and strong winds are able to lash the sea into so great a fury that it beats upon the shore with most destructive effect. Winds blowing in the same direction for some time pile up the waters as much as two feet in wide basins. As the result of a severe storm 1864, Oct. 5, it is reported that water was backed up 24 ft. in height at Calcutta. The flood which devastated Galveston in 1900 was due to a great wind storm. Such heaping up of waters causes littoral currents and undertow which are effective in erosion. In all latitudes there are winds which blow prevailingly in a given direction. Such winds together with differences in level, in density, and in temperature as mentioned above, set up continual circulation of sea water. The currents generated by trade winds are turned to the north and south when reaching the continents and are deflected towards the east by the earth's rotation. Thus in temperate zones the eastern shores of oceans are warmer and moister than the western.

Fourth, from movements caused by attraction of other heavenly bodies, notably the moon. These are the tides which sweep with such regularity and force around the world. The waves constituting them are from 3 to 70 ft. in height depending upon whether they are free or hemmed in, as they are in the Bay of Fundy.

Fifth, from movements caused by submarine volcanoes or earthquakes. Large waves which cannot be ascribed to any of the four above named causes occasionally sweep over the ocean. They are due to volcanic or earthquake shocks. In 1755 Lisbon was flooded by a great sea wave and more recently Lima, Peru, was devastated by a wave, both of which were caused by such earthquakes.

The above mentioned dynamical agencies, atmospheric and aqueous, perform the *epigene processes*—those which take place upon the surface of the earth. Those which originate below the surface are called the *hypogene pro-*

cesses. They are: *diastrophism,* the rising and sinking of continents and mountain ranges; *vulcanism,* the flow of molten rock; and *metamorphism,* the changes taking place in rocks because of heat, pressure, and chemical activity.

Plainsmen traveling for the first time in mountain regions are often surprised at the marine fossils in the rocks, forgetting that all continents were at one time under the sea. By shrinkage of the nucleus mountain ranges were elevated. Epigene agencies degraded them and deposited their substance in the sea from which hypogene agencies raised them forming plains and plateaus. This operation is in continual progress. When the change of level is sudden and accompanied by *faulting* or slipping, earthquakes occur. Changes of these kinds are taking place constantly so the earth is never free from tremors of some extent. But the great changes have come at certain periods after accumulation of stresses. See EARTHQUAKES.

Vulcanism—In many places melted rock has been forced into other rock (intrusion) or poured out on the surface of the lithosphere (extrusion) If the intruded lava came up into a long crack in the crust so as to form a wall it is called a *dike;* if it flowed between other strata, it formed a *sill;* if the strata were bowed so that the intrusion attained a dome-like form it is called a *laccolith.* Large masses of irregular shape and extent are known as *batholiths.* The more or less fused or finely divided materials thrown out upon the earth's surface come up through fissures or volcanic necks. Sometimes it is so thoroughly fused as to be quite liquid and flows rapidly down the side of the volcanic chimney, as ofttimes at Vesuvius. Again the lava being acidic and difficultly fusible as at Kilauea has a slow motion.

Vulcanism has left its impress upon all geological formations and upon all parts of the world. The amounts of lava poured out have been enormous. The plateau of Deccan, India, is covered with a layer of lava more than 4,000 ft. thick over some 200,000 sq. miles in extent, and an equal extent of country in Idaho, Washington and Oregon is buried under more than 2,000 feet of lava. They were fissure flows. These comparatively modern flows are small relatively to those which marked the earliest geological formations.

At present there are some 300 active and many times that number of extinct volcanoes. They are situated for the most part near the border of the continents at the junction of the great earth segments, that is, where the oceanic segments join the continental, and where the Asiatic-European block joins the African, and the North American approaches the South American.

The products of volcanoes are such as result from the melting of various kinds of rock under different conditions as to temperature, pressure and location. Lava may have been completely fused, or there may be unfused minerals suspended in the melted material, or the lava

may have been filled with steam and gases whose escape powdered it to volcanic ash or left it in *vesicular* condition so as to form pumice.

The gases most abundantly given off by volcanoes are sulphur, chlorine and hydrogen. They are often ignited by glowing lava or by lightning and cause a tornado of flame which proves destructive to all organisms in the region. Water from the cooling steam or from rain falling upon the dust shot by the volcano into the air often causes mud deluges.

Volcanic dust may be hurled to great heights and carried long distances by air currents. At the explosion of Krakatoa in 1883 it is estimated that dust was carried 17 miles into the air and borne by the wind around the world. For discussion of cause, products and other facts, see VOLCANOES.

Besides these processes already mentioned should be included those of *metamorphism*, whereby minerals and rocks of one kind are altered in character and bulk. The changes are either chemical or physical or both, and are most commonly caused by heat and pressure in the presence of moisture. By these processes, for example, soft coal is changed into anthracite, anthracite to graphite or even to diamond; limestone becomes marble; clay hardens into slate; sandstone becomes quartzite; and sedimentaries of mixed constitution change to gneiss.

PALÆONTOLOGICAL GEOLOGY is concerned with the plant and animal life of former times as shown by the record which has been preserved in the rocks. Animals and plants living in the water or on land and washed into the water were often buried in mud. Circulating water removed part of the original organic material and replaced it with mineral. The mud itself was lithified and by elevation and withdrawal of the water became dry land. These mud-formed or sedimentary rocks are found in all parts of the world and nearly always contain fossils. The number of different kinds of animals whose remains have been found is enormous and presents a vivid picture of the inhabitants of the world in the past. But the number which have been found must fall far short of the varieties which lived, since for the preservation of the land forms especially, conditions were not often favorable and of the multitude which lived, only here and there an individual would be preserved from oxidation and total disappearance However even these imperfect records show that life began with simple, humble forms and progressed by long, slow stages to the more complex and highly organized. The oldest rocks contain brachiopods, bryozoans and corals, later rocks show the incoming and ascendancy of fish. Then after gradual appearance reptiles and amphibians assume the ascendancy. These in turn are followed by the higher vertebrates among which man himself finally makes his appearance. A similar development is exhibited in the vegetable world Succeeding faunas and floras show a gradual beginning, a

period of maximum luxuriance and finally a period of decadence. Not only are fossil remains interesting because of the picture of the past which they present, but they are invaluable also as a means of indicating the position of geological strata and are thus an aid to general and economic geology. For further facts see PALÆONTOLOGY.

Very closely related to palæontological geology is that branch of the science which treats of the succession of events through which the world has passed in reaching its present condition. This is HISTORICAL GEOLOGY. It treats of the history of the world from its earliest beginnings to the present, utilizing the facts developed in all the other branches of the science.

The origin of the world is enveloped in mystery too deep for penetration with facts now at command. There are three theories concerning its early condition. The contraction of a widely diffused nebular mass produced a molten globe. According to one theory this mass lost heat by radiation and a *crust* was formed on the surface. According to the second theory heat was lost by convection and as a result of such loss in conjunction with intense pressure (3,000,000 atmospheres at the center) solidification began at the *center*. According to the third theory the earth was built of accretions of solid materials or of infinetesimal planetoids revolving around a common center. When their mass became large enough, pressure produced heat sufficient to fuse the original cold particles and cause their segregation into the various kinds of rock which now constitute the world. The two latter theories agree in making possible a practically solid globe. Since astrophysical facts show that the earth has nearly the rigidity of steel, the two latter theories are more satisfactory than the former.

The time since the *astral era*, which is so problematical, has been divided into five great eras. These *eras* are composed of different *periods* which are divided into different *epochs*, and in turn are made up of different *ages*. The rocks which were made in a given age constitute a *formation* or *stage*. Several formations requiring an epoch for their making, constitute a *series*. Several series of strata made in the same period produce a *system*. Several *systems* constitute a *group*.

These *stratagraphic* and *time* divisions are shown in the table on the following page.

The names of the two largest divisions, that of the *groups* and *systems*, are world-wide in their application. The *series* names given here are those employed in the United States and were for the most part obtained from the localities where the rock series were first studied and are best developed. The names of the *stages* are omitted since they are generally local in importance.

The early workers in geological science became best acquainted with rocks formed in what they named the *Primary* or *Palæozoic era* thinking that life began at that time. More recently it became known that there were

two great eras before that. In the first, the *Archæozoic*, the era of most ancient life, the Archæan system of rocks were formed. This is the only system which underlies the whole surface of the globe. It is composed of rocks which are igneous or metamorphic and which have been subjected to great stresses and destruction. None of the life of that time has been preserved, and the only evidence of its existence is found in the presence of such mineral substances as chert, graphite and bedded iron ore—all of which often owe their origin to organic agencies.

Era (Group)	Period (System)	Epoch (Series)	Age (Formation or Stage)
Cenozoic	Recent or Human		
	Pleistocene (Glacial)		
	Pliocene		
	Miocene		
	Eocene		
Mesozoic	Cretaceous	Upper C. (Arapahoe)	
		Lower C. (Comanchean)	
	Jurassic		
	Triassic		
	Permian	Cimarron	
		Blue Ridge	
Palæozoic	Carboniferous	Monongahela	(Pennsylvanian)
		Conemaugh	
		Allegheny	
		Pottsville	
		Chester	
		St. Louis	(Mississippian)
		Osage	
		Kinderhook	
	Devonian	Chemung	
		Hamilton	
		Corniferous	
		Oriskany	
		Helderberg	
	Silurian	Cayugan	
		Niagaran	
		Oswegan	
	Ordovician	Hudson River (Cincinnati or Maquoketa)	
		Utica (Galena)	
		Trenton	
		Chazy (St. Peter's Sandstone)	
		Calciferous (Magnesian Limestone)	
	Cambrian	Potsdam	
		Acadian	
		Georgian	
Proterozoic	Algonkian	Keweenawan	
		Huronian	
Archæozoic	Archæan	Keewatin	
		Laurentian	

The system is divided into two chief series, the *Laurentian* and the *Keewatin*, both of whose rocks are granitoid. The Keewatin contains more gneissic rocks than does the Laurentian.

The second era is called *Proterozoic*, i.e., 'earlier life' in reference to the next succeeding era—the Palæozoic—which embraced all ancient life according to the thought of the early workers in the science. During this time the *Algonkian* rock system was forming. These rocks rest upon the igneous rocks of the Archæan and are followed

by rocks which have not been so greatly metamorphosed and therefore made so completely crystalline.

The oldest of the two series which compose this system, the Huronian, consists of metamorphic rocks, chiefly schists; and even the latest rocks to be formed, the Keweenawan, have been so changed from the original sandstone, limestone and shale as to become thoroughly crystalline so that all the fossils contained in them were destroyed.

The third era, the *Palæozoic*, comprises six systems and witnesses to remarkable change in the life forms which began to spread over the earth.

In the lowest system of this group, the *Cambrian*, the plants were of the simplest sort of sea weed (*Algæ*) (q.v.). In the oceans were low forms of fish such as *Pterichthys*. But the rulers of the period were the *trilobites*. The rocks were typically such as would be laid down in the ocean. The *Georgian* series consist of impure limestone; the *Acadian*, shale; and the *Potsdam*, sandstone.

The *Ordovician* system marks the next step in the advance of life forms. A higher type of fish appeared in numerous representatives of the Placoids and Ganoids. Corals became abundant. The first remains of *land plants* are found in this system. The rocks in the five series are magnesian limestone in the *Calciferous*, sandstone in the *Chazy*, (or *St. Peter*, as it is called in the Mississippi states), limestone in the *Trenton*, limestone and shales in the *Utica* (or *Galena* as it is called in the middle west), and shales in the *Hudson River* series (known as *Cincinnati* or *Maquoketa* in the west).

Between the periods in which the various rock systems were formed were periods of distortion and destruction when the layers previously laid down were elevated or depressed, tilted and faulted, and subjected to various disintegrating and destroying agencies till greatly distorted and eroded. This occupied immeasurable periods of time and led to such pronounced unconformity between the old rocks and the layers to be later deposited upon them as to have necessitated a sharp division of the older from the later by classifying them into different *systems*. Minor *unconformities* mark the alternation of the various series. The change in the fauna and flora at these times is often so great as to furnish the chief evidence of the extensive nature of this change in the rocks and the length of time implied.

The Ordovician system is followed by the *Silurian* without any great break in life forms but with a gradual advance. The cephalopods were more numerous than were any other species and they were followed closely by trilobites and brachiopods, gasteropods and lamellibranchs. Then there were many corals, echinoderms, and sponges. Less than 100 species of fish are known. Together more than 10,000 species of animals have been described in the two systems.

The *Devonian* system consists of rocks of a character

similar to those of the Silurian. The *Helderberg* series are largely sandstone, the *Oriskany* and *Corniferous* limestone and the *Hamilton* and *Chemung* shales. Animal life increased in variety and luxuriance. The number and size of fish became so striking that the period is called the age of fishes. Plant life also showed marked development.

But it is in the succeeding period—the *Carboniferous*—that plant life becomes supreme. During this period a warm, moist climate prevailed. The atmosphere contained a high per cent. of carbon dioxide and because of these favorable conditions vegetation flourished to an almost inconceivable extent. As a result vast quantities of hydrocarbon compounds were formed and stored up to be subsequently of untold value to man as fuel. The system is divided into two groups of series—the lower, the *Unproductive Carboniferous* or *Mississippian*, consisting of the *Kinderhook, Osage, St. Louis* and *Chester* (or *Kaskaskia*); and the upper called the *Productive Carboniferous* or *Pennsylvanian*, consisting of the *Pottsville, Allegheny, Conemaugh* and *Monongahela.*

The last period of the Palæozoic era is that in which the *Permian* system was formed. It is a period of transition. Its rocks are conglomerates, sandstones and shales. Its vegetation resembles that of the preceding systems but in far less luxuriance. The first reptiles made their appearance in this period.

Between the *Palæozoic* and the *Mesozoic* which is the fourth era there was a long period of transition.

The *Triassic system* is the first series of rocks to be formed in the Mesozoic era. It consists of sandstones and shales. The sandstones are of a pronounced red color and stretch for hundreds of miles throughout some of the Western United States, giving a striking aspect to the landscape. One of the most important facts in connection with the Triassic system is this, that in its rocks remains of mammals first make their appearance.

The second system in the Mesozoic is the *Jurassic* whose blue shales, limestones and white sandstones cover the Triassic and in some of whose formations the remains of gigantic reptiles—the dinosaurs, etc.,—are found. The Jurassic is a good example of a system which has been well differentiated by means of lithological and palæontological characteristics. In Germany, for example three different series—the *Lias, Dogger*, and *Malm*—are generally represented and have been subdivided into some thirty *stages*. In the United States the system has not such extensive vertical development nor has it been so well marked as to its boundaries. It has even been customary to group the two systems together under the name Jura-Trias.

The third and closing system of the Mesozoic, the *Cretaceous*, has extensive development in the Western United States where the rocks which constitute it are largely chalk, limestone, and marl, while shale and sandstone are less conspicuous.

Palms, oaks, beeches and poplars made their appearance at this time.

The Cretaceous received its name from the great deposits of chalk which it contains. The chalk is composed of shells of Foraminifera, animals of simple structure and very minute size which flourished by myriads and at death left their shells to fall like a shower upon the sea bottom to be subsequently solidified by pressure and chemical action.

In general the Cretaceous is a transitional period in which Mesozoic life forms are dying out and modern or *Cenozoic* forms are coming in.

The *Cenozoic era* was ushered in by the *Eocene* system in which modern forms of life become prominent. *Eohippus*, the ancestor of the modern horse, made its appearance and in the succeeding periods appeared as protorohippus, mesohippus, miohippus, protohippus and finally equus. The genealogy of many other animals also has been traced from Eocene to the present but that of the horse is one of the best known and described.

Pachyderms began in the Eocene. The ancestors of the modern rhinoceros and hippopotamus, were spread far and wide in parts of the world where to-day they are not found. In the *Miocene* this development continued. Ruminants and whales appear and vegetation reaches its maximum in variety and luxuriance of modern species.

In the *Pliocene* Proboscidians appeared and were the giants of the time as they are of the present period. Some of them, such as the dinotherium, mastodon, and mammoth have become extinct. But others such as the elephant remain to-day. Rhinoceroses, hippopotamuses, the elk, the saber-toothed tiger and cave bear flourished.

Appearance of Man.—One of the most interesting occurrences of the Pliocene from the human standpoint is the probable appearance of man at this time. As to the time of the appearance there is some uncertainty inasmuch as it has not yet been possible to definitely establish the age of the deposits in which various remains have been discovered. One of the most interesting finds of recent years was that of the *Pithecanthropus erectus* in deposits in Java which were thought to be of Pliocene age. The bones are an abnormal femur, two teeth, and a skull with a forehead lower than that of the famous men of Spy or that shown by the Neanderthal skull. These two latter relics were found in caves in Europe associated with remains of the cave bear, saber-toothed tiger, and reindeer. The finding of other fossil remains of man may shed new light upon the interesting question. At present, estimates as to the antiquity of man vary bebetween 50,000 and 300,000 years.

Following the Pliocene came the *Pleistocene* with its changes of temperature which permitted the formation of extensive ice sheets which covered the North American continent as far south as the Ohio river and which formed glaciers of continental proportion in Europe and other

portions of the world, causing migrations of fauna and flora, and changing the character of the earth's surface both by erosion and deposition.

The Cenozoic is brought to the present by the *Recent* or *Human period* in which the agencies which were described in previous portions of this article are at work, and in which a new agency, man, has appeared to change the face of the world by the destruction of some animals and vegetation, the cultivation of others, the deflection of streams, the increase or control of floods, the exposing of great stretches of deforested land to denudation, etc.

Thus we read in the record of the rocks that the oldest formations have been subjected to the greatest stresses and strains and were most solidified and lithified. The younger formations are left more as originally laid down, and finally the youngest formations are uncemented and are often no more than simply aggregates of gravel, sand and mud.

The oldest record of life shows that plants and animals of lowly structure made their appearance first and as succeeding ages passed, forms of increasing complexity and development appeared. The period of invertebrates (*Silurian*) was followed by the period of fishes (*Devonian*); and that by the periods of reptiles (the *Jura-Trias*), and finally the period of the higher mammals (*Recent*).

The time involved in the evolution is long. An idea of its extent is obtained by studying the rapidity of erosion of a river like the Niagara which has cut back its falls about 12 miles from Lake Ontario, or the rapidity with which deltas like that of the Mississippi are formed, or the rapidity with which bars are deposited in stationary bodies of water, or by considering the rate of loss of heat and moisture by the earth and by studying other geological and astronomical phenomena. The result of such investigation which at present serves to no more than convey an idea of the possibilities leads to the thought that the world may be from 8,000,000 to 500,000,000 years old.

Economic Geology is that branch of the subject which treats of the effect of geological history upon mankind. It considers the origin, condition, properties and use of minerals and rocks. It presents geological facts with the view of rendering assistance in the location and winning of precious ores and the vastly useful and extensive non-metallic mineral resources.

GEOMANCY, n. *jē′ō-măn′sĭ* [F. *géomancie*—from Gr. *gē*, the earth; *manteia*, divination]: divination by points or circles drawn on the ground, and afterwards on paper. Ge′oman′tic, a. *-tĭk*, pertaining to. Ge′oman′cer, n. *-sėr*, one who.

GEOMET′RIC, or Geometrical: related to Geometry (q.v.), as a geometrical line, demonstration, construction, etc. As to geometrical lines, see Co-ordinate: Curve, Demonstration. Geometrical constructions and solu-

tions were anciently such as were effected by means of the straight line and circle—the only lines regarded as properly geometrical—and according to the strict rules of geometry. The ancient geometers employed two methods of reasoning in their inquiries and demonstrations, known as *geometrical analysis* and *synthesis*. Of these, the synthetical method was the older and more generally employed. It is abundantly illustrated in Euclid's *Elements*, in which new truths are deduced from combinations of truths already established, so that every proposition depends on others preceding it: see SYNTHESIS. Though admirably suited for the demonstration of truth once ascertained, this method was found of little use in the discovery of truth, or of the mode of its demonstration. For these purposes, the analytical method is admirably adapted: see ANALYSIS. According to this method the proposition which is to be proved is assumed to be true, or the construction required is supposed to be effected; and then the conditions of the proposition being true, or the construction effected, are investigated by reasoning backward till some elementary truth or simple construction is reached, on which the truth or construction under inquiry is seen to depend. The analytical method of reasoning in geometry is said to have been invented by Plato. The Greeks have left on record many proofs of the power and beauty of the method as a means of discovery.

GEOMET'RICAL PROGRESSION: denoting a series of numbers, in which each term of the series is equal to that which precedes it multiplied by some constant factor, i.e., some factor which is the same for all the terms; or, in other words, when the ratio of any two successive terms is the same. Thus a, ar, ar^2, ar^3 ... and 2, 6, 18, 54 ... are geometrical series. The sum of n terms of the former series may be easily obtained. Let it be S. Then $S = a + ar + ar^2 + \ldots + ar^{n-1}$. Multiply both sides by r, we have $rS = ar + ar^2 + \ldots + ar^n$. Subtracting the former of these expressions from the latter, we have $(r-1)S = ar^n - a$. Whence we have $S = a.\frac{r^n-1}{r-1}$. If the series be one whose terms constantly diminish, i. e., if $r < 1$, and then if we suppose n indefinitely great, r^n will be indefinitely small, and we shall have $S = \frac{a}{1-r}$ for the sum of the series extended *ad infinitum:* e.g. the sum of the series $\frac{3}{10} + \frac{3}{10^2} + \frac{3}{10^3} + \ldots$ *ad infinitum* is $\frac{1}{3}$; it is obvious that any three of the four quantities a, r, n, S being given the equation $S = a.\frac{r^n-1}{r-1}$ will enable us to find the fourth.

GEOMETRINA, n. *jē-ō-mĕt-rī'na:* group or tribe of moths of which the *Geometridæ* is the type. It includes all the emerald moths.

GEOMETRY.

GEOMETRY: that branch of mathematics which treats of form and space relations and the properties, relative magnitudes, and measurements of angles, lines, surfaces, and solids. Next to astronomy it is the oldest of the exact sciences and was cultivated with great interest by the ancient Greek philosophers. It is supposed to have had its earliest developments in Egypt. The name 'Geometry' (from *gē* the earth, and *metrein*, to measure) indicates that the science was early used for measurements of the earth's surface and ancient historians claim that many of the earliest known geometric properties were developed in attempts to recover landmarks swept away by the periodic overflow of the Nile.

Ancient Geometry was confined to the study of particular forms, chiefly triangles, parallelograms, and other rectilinear figures, circles, spheres, the right circular cone and its plane sections, and solids bounded by plane surfaces. Its forms were always confined to a limited portion of space and all parts of them were accessible. The whole body of ancient geometric knowledge was fragmentary, having grown up little by little by the occasional addition of a new theory or property. It was characteristic that theorems should be announced and demonstrated with great vigor without any intimation as to how the relations stated were discovered, or that similar relations existed for other forms of the same class. Euclid of Alexandria (B. C. 330–275) undertook the formulation of the geometric knowledge of his time into a systematic treatise in which the demonstration of each theorem was made to depend on properties already demonstrated and on constructions which were not only possible but which had actually been made. This treatise known as *Euclid's Element's* has been the model, more or less closely followed, of all works on the elements of geometry from his day until the present, and though perhaps never intended as a textbook in the modern sense, it is still used as such in many schools, notably in English public schools.

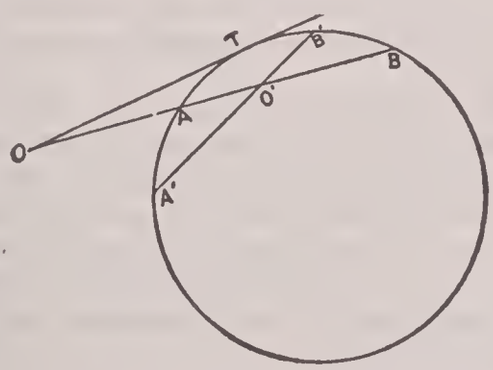
For convenience Euclid's Elements was divided into thirteen chapters or *books*, the first four and the sixth relating to plane figures, including the circle, the fifth containing a general theory of ratio and proportion, which in the sixth was applied to a treatment of the similarity of plane rectilinear figures. The eleventh and twelfth books related to three-dimensional figures; books VII-IX treated of the properties of number; book X to incommensurable magnitudes; and book XIII contained miscellaneous propositions in plane and solid geometry.

Before Euclid, among the ancient geometers, the most notable were Thales of Miletus (B.C. 640–546) and Pythagoras (B.C. 569–500) to whom is due the well known property of the right-angled triangle, that the square constructed on the side opposite the right angle is equal to the sum of the squares on the other two sides. Following Euclid were Archimedes (B.C. 287–212) and Apollonius of Perga (B.C. 260–200) under whom ancient geometry

reached its highest perfection, the former devoting much study to metric properties to physical problems by means of Geometry, and the latter by treating Geometry as a science of form rather than of measurement, extending the methods of his predecessors and carrying his investigations on the plane sections of a cone (conic sections—ellipse, parabola, hyperbola) so far as to leave few of their properties undiscovered.

The most notable of the geometers of the early Christian centuries was Pappus of Alexandria. His *Mathematicæ Collectiones*, written toward the close of the fourth century, was a compilation of the scattered works of earlier geometers, to which he added so much that was original as to place him in the first rank. This work, along with Euclid's Elements, is the chief source of information on ancient geometry. Many of the principles there stated have proved to be the foundations of much that has been developed in later years.

Modern Geometry is characterized by unity and a generality of application which the ancient geometry did not possess. The assumption of the *principle of continuity* and the consequent introduction of *imaginary points, lines, and planes*, marked a new era in geometrical investigations. As early as the sixteenth century Kepler noted that the conclusions to be drawn from a geometric construction were not restricted to the particular figure from which they were deduced, but that the figure might be continuously altered, subject only to the conditions under which it was first made, without invalidating the conclusions. This principle he called the principle of continuity and in the hands of Desargues, Pascal, and others it was rapidly being applied to unify and extend the fragmentary ancient geometry. As an illustration of the principle the following may serve:



Suppose O is any point outside of a circle and OAB is a secant of the circle. It is known (Euclid Bk. III, Prop. 37) that the product of the segments $OA.OB$ is equal to the square on OT, where OT is tangent to the circle at T. Hence $OA.OB = OA_1.OB_1$ so long as OAB and OA_1B_1 are both secants intersecting at the point O, either product being equal to OT^2. Suppose now that the point O moves, continuously approaching the circle and finally passing inside, as at O'. Then AB and $A'B'$, are secants inter-

secting at O' and the theorem would take the form $O'A.O'B, = O'A'.O'B'$, which is true (Euclid, Bk. III, Prop. 35). From the principle of continuity, the latter form of the theorem would follow immediately, but otherwise it would need independent demonstration. The fact that the tangent OT, which was used in the original demonstration, disappears when the point O passes inside the circle does not affect the validity of the theorem in the later form.

If, on the other hand, one secant OAB remains fixed while the other OA_1B_1 rotates about the point O, in one position the rotating secant will coincide with the tangent so that the equality takes the form $OA.OB = OT.OT$ or OT^2. If the rotation is continued, the secant will no longer intersect the circle in the ordinary sense, but under the principle of continuity the intersections are said still to exist and to have become *imaginary*. Imaginary elements in geometry cannot be localized, and theorems in which they play a part as a result of the application of the principle of continuity may lose practical significance, but they cannot in consequence become untrue or from the geometer's point of view become unimportant.

Another feature which marked the beginnings of the modern geometry was the introduction of *infinitely distant elements* into the field of reason. Such elements added greatly to the generality of geometric theorems and simplified their forms of statement though they are beyond the possibility of geometric construction. As a simple example of their place in geometry, two straight lines in a plane may be said always to intersect in a point, if not in a finite point then in an infinitely distant point.

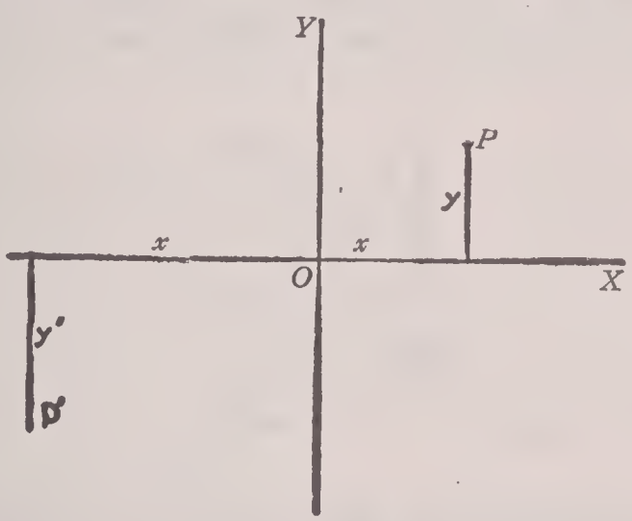
With these new concepts and an awakened interest in geometrical study, the 17th century gave promise of a rapidly enlarging knowledge and the creation of practically a new science, which unhappily was delayed for over two centuries by the diversion of the attention of mathematicians from geometric concepts to a new geometric method.

About 1620 Descartes began to make use of a scheme for locating points in space by referring them to certain fixed straight lines or fixed planes and to apply his notation to the solution of geometrical problems. From this there developed the so-called *Coördinate Geometry* or, as it is more frequently called, *Analytical Geometry*. Some idea of this Cartesian method may be gained from the following:

A point P is definitely located in a plane if its distances from two fixed straight lines are known, provided it is also known on which side of each line the point lies. These distances, x, y, are called the coördinates of the point P with respect to the fixed lines, or axes, OX and OY. The coördinates are positive or negative according as the point lies on one side or the other of the axis. The line OX parallel to which the x- coördinate is measured is called the axis of abscissae, the other OY is the axis of ordinates. For all points on the axis of abscissae

$Y=0$; and for all points on the axis of ordinates, $X=0$. The point O is called the origin of coördinates.

If in an equation $ax+by+c=0$, x and y are the coördinates of a point P, these varying in any way so as only the equation is satisfied, then the point may move in the plane subject only to the restriction that its coördinates must satisfy the equation, which in consequence is called the equation of the locus of the point. If the equation is of the first degree in x and y, the locus is a straight line crossing the axis of abscissae at the point where $y=0$, that is at the distance $\frac{c}{a}$ from the origin and crossing the axis of ordinates at the point where $x=0$, that is at the distance $\frac{c}{b}$ from the origin. Two loci whose equations are $ax+by+c=o$ and $a_1x+b_1y+c,=0$ have in common the point or points whose coördinates satisfy both equations. The equations being of the first degree have only one pair of values which will satisfy

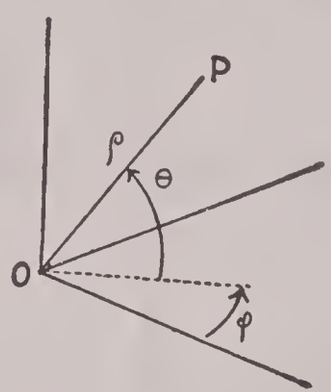


both; hence the loci intersect in only one point whose coördinates are thus known. If the equation is of the second degree in x and y, the locus intercepts the axes, or any other straight line, for that matter, in two points, real or imaginary. The plane section of a right circular cone is such a locus. Equations of a higher degree represent loci which are intercepted by straight lines in more than two points, that is to say, they represent curves of higher order. By a study of the equation and its properties, the character of its roots and the transformations which it may undergo, the properties of the curve represented by it may be determined.

Points in space not all lying in the same plane may be located by noting their distances from three fixed planes which meet in a point, and the properties of surfaces and curves, the loci of moving points in space, may be determined by a study of equations connecting these coördinates. A single equation connecting the three coördinates of a point will permit the point to move on a surface, while two equations connecting the three coördi-

nates leave the point free to move along a curve in space. The system of coördinates just described in which points are referred to certain fixed straight lines as axes is called *Cartesian coördinates* from Descartes who first put it to practical use. Another system is what is known as *Polar Coördinates.* By these the position of a point P in a plane is determined by referring it to a single fixed line a and a fixed point O in that line. The distance OP, usually denoted by ϱ, and the angle which OP makes with a, denoted by θ, are the polar coördinates of the point. Algebraic equations involving these coördinates likewise serve to describe the locus of the point P. In three-dimensional geometry (solid geometry) a point P is located by three polar coördinates, the distance OP or ϱ, the angle θ which OP makes with a fixed plane, and the angle ϕ between a fixed plane and a movable plane through OP, both of which are perpendicular to the first fixed plane.

Other systems of coördinates are sometimes used, for instance in Solid Geometry, *Cylindrical Coördinates* in which a point is located by two distances and one angle, namely, its distance from a fixed point, and the angle



between the plane of these two distances and a fixed plane.

In *Coördinate geometry* (*analytical geometry*) the processes and operations are algebraic. A geometric concept is expressed in algebraic language by means of one or more equations, certain algebraic operations are performed, and the result is then interpreted back into geometric language, thereby deducing certain geometric conclusions. In the example given above two straight lines are represented by the equations $ax+by+c=0$ and $a_1 x+b_1 y+c_1=0$. If these are solved as simultaneous equations, single values of x and of y will be found which satisfy both. This means that the two straight lines have but a single common point, namely their point of intersection. Similarly, a straight line (equation of the first degree) and a conic (equation of the second degree) have two points of intersection, since two pairs of values can be found satisfying the two equations, while two conics (equations of the second degree) have four points of intersection (four simultaneous values for x and y) real or imaginary. Such treatment of geometric problems is in

marked distinction from the older *Pure Geometry* methods in which all of the manipulations are made with the geometric concept constantly in mind.

It ought carefully to be noted that Analytical Geometry is not a distinct science, but rather a method for the treatment of geometric problems which might in some instances at least be treated as advantageously by other means. As a device for the study of geometry it proved so interesting and curious that for a century and a half (1650–1800) the older methods of pure geometry were practically abandoned. Many properties of geometrical figures which had long been studied in vain by the older methods yielded readily to the new notation, and while not many new ideas were added during this period much was done to put in tangible form the concepts which had marked the beginnings of the modern Geometry.

The infinitesmal calculus of Newton and Leibniz, developed almost contemporaneously with the analytical geometry in its application to the study of the minute parts of curves and surfaces—*Differential Geometry*—has proved a valuable instrument in geometrical investigations, especially in determining the metrical properties of figures.

Early in the nineteenth century a new interest in pure geometry was developed following the publication of Monge's *Géométrie Déscriptive* in 1805. This work employed the method of parallel projection and showed how certain properties of curves can be studied to advantage in that way. It is recognized as the foundation of the modern *Projective Geometry* which was developed so highly during the first half of the century by Poncelet (1788–1867), Steiner (1796–1863), Von Staudt (1798–1867), and Chasles (1793–1880).

Projective Geometry concerns itself chiefly with a study of those properties of curves which are unaltered by a central projection. Since a circle, an ellipse, a parabola, or a hyperbola, for instance, can be cut by a plane section from the same cone, certain properties of any one of them will have entirely analogous properties in any of the others, and a study of one curve suffices for a study of the whole class. Such properties are however in the main purely positional and not metric.

It was noted by Pappus, and also by Desargues, that the anharmonic ratio of four points on a straight line was unaltered if these points should be projected by a central projection into four points on any other straight line. This property in one form or another has been used as the foundation of the modern theory and from it there has been developed a purely synthetic geometry of position in no way dependent on metric notions. In this geometry the principle of continuity and the principle of reciprocity or duality, by which theorems relating to certain figures may be converted into theorems relating to analogous figures by an interchange of points and lines, or of points and planes if the figures is of three dimensions, play important parts.

GEOMETRY.

Geometry is sometimes classified as *Elementary* or *Higher*. In elementary geometry all constructions are supposed to be made by the use of the straight edge or ruler and the circle. Ancient geometry was entirely of this kind and the attempts to make constructions with the aid of these instruments alone have attached peculiar interest to certain problems, so much so in fact that they have come down to us as the famous problems of geometry. These are (1) the trisection of an angle; (2) the determination of the ratio of the circumference of a circle to its diameter; and (3) the construction of a cube whose volume is double that of a given cube. The solution of these by the methods of elementary geometry has within the last fifty years been proved impossible. Higher geometry embodies all that is not restricted to the range of elementary geometry.

Another classification of Geometry is into *Euclidean* and *Non-Euclidean*. In his elements Euclid laid down a postulate known to us as Axiom XII to the effect that 'If one straight line intercepts two other straight lines so as to make the two interior angles on one side less than two right angles, then the two straight lines will meet if produced toward that side on which the angles are less than two right angles.' In the study of Euclid this was long contended to be axiomatic, while in fact it is an assumption defining the nature of the space in which the geometry is true. Various other forms of this assumption have been used by writers on Elementary Geometry, as for instance 'If two straight lines are perpendicular to the same straight line they must be parallel,' or 'Two intersecting straight lines cannot both be parallel to the same straight line;' this latter being the form in which Playfair stated the postulate. But while they may be easier to accept, they all in fact involve the same assumption. Euclid's assumption is the direct converse of a theorem which he had proved by methods involving the essential nature of the space in which he was working, namely theorem that 'any two angles of a triangle are together less than two right angles.' (Bk. I Prop. 17). By the same assumptions it is proved that 'the three interior angles of a triangle are together equal to two right angles.' These assumptions are in effect that geometrical figures may be moved about in space without distortion and may even be lifted out of their places, turned over and placed back so as to fit the space without distortion. With Euclid's conception of a plane that was possible, but if the space should partake of the nature of what we call the surface of a sphere the first would be possible while the second would not, and on the surface of an ellipsoid neither would be possible.

After fruitless attempts to prove Euclid's postulate it was observed by Bolyai and by Lobachevsky that an equally logical geometry could be built up on assumptions other than that of Euclid. Such geometries have been developed by the two writers named and by Riemann.

These are known as *non-Euclidean* geometries. In one of these the three interior angles of a triangle are together less than two right angles, in another they are together greater than two right angles, while in *Euclidean* geometry they are together equal to two right angles.

Still another classification is into *Plane Geometry* (two-dimensional), *Solid Geometry* (three-dimensional), and *Hyperspace Geometries* (four-dimensional or more). In a plane, at any point two and only two straight lines can be drawn at right angles to each other; in ordinary space as we understand it, three straight lines can be drawn at any point each of which is perpendicular to both the others. A space might be conceived in which at any point four straight lines could be drawn so that each is perpendicular to all the others. Such a space would be called a four-dimensional geometry. Without asserting the existence or non-existence of such a space, geometers have carried over by analogy many of the properties of two and three-dimensional geometry into four-dimensional space, and even into space of higher dimensions. Speculations as to what could transpire in a four-dimensional space have led to many curious and interesting conclusions but with these the geometer has little to do. They are perhaps no more surprising than to a being whose knowledge was confined to a plane would be the things which actually take place in a three dimensional space.

See CURVES; FOUR DIMENSIONAL GEOMETRY; GEOMETRY, NON-EUCLIDEAN.

GEOMETRY, DESCRIPTIVE: a branch of Mathematics in which the properties of curves and solid bodies are studied from their projections on two planes at right angles to each other. The projections are made by lines perpendicular to the plane of projection, so that metric properties as well as properties purely descriptive can be studied. One of the planes is usually chosen horizontal and the other vertical, and the corresponding projections are spoken of as the horizontal projection or the vertical projection. The intersections of the body under consideration with a plane of projection is called the *trace* on the plane. Descriptive geometry is used largely in architecture and all branches of engineering.

GEOMETRY, NON-EUCLIDEAN: geometric system based on axioms and postulates different from those of Euclid. Also called *Absolute Geometry, Metageometry,* or *Pangeometry.* The whole subject of measurement in ordinary geometry rests logically on Euclid's 5th Postulate (erroneously called the 11th Axiom), viz., 'If two straight lines are cut by a third one so that the sum of the internal angles on the one side of the latter is less than two right angles, the two lines if sufficiently produced will meet on that side of the third line.' This postulate may be experimentally verified within the limits of instrumental error in any number of individual

cases, but it cannot be logically proved. Legendre, after every effort to obtain a proof, *Eléments de Géométrie*, 1794, gave up the task. Later (1825-1855), Bolyai and Lobachevsky established a consistent geometry in which the 5th postulate was denied. This postulate is equivalent to and may be replaced by either of the following: (1) the sum of the angles of a triangle is two right angles, or (2) through a given point only one parallel can be drawn to a given line. In the Bolyai-Lobachevsky (or hyperbolic geometry) the sum of the angles of a triangle is less than two right angles, and an infinite number of lines can be drawn through a given point which never meet a given line no matter how far produced. The lines fill out an angle with the given point as vertex; the two boundary lines are called *parallel* to the given line. Over against this system stands the Riemann (or elliptic) geometry, in which the sum of the angles of a triangle is greater than two right angles and *no* parallel can be drawn to a given line from a given point. Between these two stands our common Euclidean (or parabolic) geometry, in which the sum of the angles of a triangle is equal to two right angles and *one* parallel can be drawn to a given line from a given point. Which of the three geometries actually fits the space in which we live is impossible to determine, our measurements being confined to a region too small to permit of detecting a slight hyperbolic or elliptic deviation from the parabolic norm. One form of the elliptic geometry may be interpreted on a sphere, the great circles taking the place of the straight lines of a plane. Here the sum of the angles of the (spherical) triangle is greater than two right angles, and no great circle can be drawn parallel to (i.e., so as not to cut) another. Similarly the hyperbolic geometry can be interpreted on the pseudo-sphere or surface of constant negative curvature. If a pencil of curves be drawn on this surface corresponding to a pencil of straight lines in the plane, any other such curve will cut only a part of the curves of the pencil, the last ones cut corresponding to the *two* parallels in the plane to a given line. From the standpoint of projective geometry Cayley and Klein have shown that all three cases can be included in a single formula and differ only in a constant multiplier the value of which determines the particular type. This constant is regarded by Riemann as indicating the degree of *curvature* of space, i.e., its departure from the type of space as conceived by Euclid.

GEO-NAVIGATION, n. *jē'ō-năv'ĭ-gā'shŭn* [Gr. *gē*, the earth, and *navigation*]: a term proposed for that branch of the science of navigation in which the place of a ship at sea is determined by referring it to some other spot on the surface of the earth.

GEONOMY, n. *jē-ŏn'o-mĭ* [Gr. *geō* for *gēios*, belonging to the earth; *nomos*, law]; science of the physical laws relating to the earth, as geology and physical geography.

GEOPHAGISM, n. *jē-ŏf′a-jĭzm* [Gr. *gē*, the earth; *phagein*, to eat]: act or habit of eating earth. The habit is common among the Ottomac Indians of S. America, the Indians in the Hudson Bay region, the blacks in the W. Indies, some classes in Lapland and n. Scandinavia, and the lowest order of whites in several of the Southern States of the American Union. In Md. they are called 'clay-eaters;' N. C., 'crackers;' Ga. and S. C., 'sand-hillers.'—A particular kind of ferruginous clay is sold largely in Bolivia as an article of food. Several reasons for eating clay have been advanced. The Hopi Indians of Arizona claim that by mixing clay with the small tubers of the wild potato (*Solanum Jamesii*), the acridity of the root is greatly reduced. A supply of red ochre and oleaginous clay is carried by the Dyaks in their canoes in order to make their rations last longer, and the Veddahs of Ceylon eat a mixture of decayed wood and honey in times of famine; in these last instances the claim being that the bulk of the food appeases the hunger by giving a sensation of fullness to the stomach. Another reason is that it improves the complexion. Among chlorotic young women the appetite is not uncommon. The habit is largely due to morbid or nervous conditions and continued practice causes death by dropsy or dysentery. GEOPH′AGIST, n. *-jĭst*, one who practices geophagism; one who eats dirt.

GEOPHILIDÆ, n. *jē-o-fĭl′ĭ-dē:* n *zool.*, family of centipedes, order *Chilognatha*, Geophilus being the type.

GEOPHYTE, n. *jē′o-fīt* [Gr. *gē*, the earth; *phyton*, plant]: a plant whose perennial organs live under or close to the ground. Those with organs entirely beneath the surface during periods of lesser activity are called extreme geophytes, such as onions, Indian turnips, sweet-flag bracken-fern, lilies, and spring beauty. Most geophytes have two distinct life aspects, in the period of growth (the summer or rainy season) having aërial organs such as flowers and leaves, and in the resting period (the winter or the dry season) being inconspicuous through absence of such organs.

GEOPONICS, n. plu. *jē′ō-pŏn′ĭks* [Gr. *gē*, the earth; *ponos*, labor]: the art or science of cultivating the ground. GE′OPON′ICAL, a. *-ĭ-kăl*, relating to agriculture. GEOPON′IKA, collection of agricultural treatises by various Greek authors, published in Constantinople during the reign of Emperor Constantine. Varro, writing in the c. preceding the Christian era, said there were more than 50 authors who could be consulted on the subject of agriculture, all of whom were ancient Greeks except Mago, the Carthagenian. Among these authors he included Democritus, Xenophon, Aristotle, Theophrastus, and Hesiod, and said that the writings of all the others had been destroyed. Only a few extracts from the agricultural writings of Democritus have been preserved, and they are found in the Geoponika. Theophrastus wrote on natural history

and is considered the father of botany. But for a detailed knowledge of Grecian agriculture recourse must be had to Hesiod's writings. The Geoponika is divided into 20 parts, and each chapter bears the name of the author from whose works it was taken. The subjects are very comprehensive, are treated with more or less detail, and form a complete exposition of the industry of the best Grecian authorities.

GEORAMA, n. *jē-o-râ'ma* [Gr. *geō* for *gēios*, belonging to the earth; *horama*, view]: concave globe on the inside of which the countries, oceans, etc., of the earth are represented to the spectators, who stand on a framework inside.

GEORDIE, n. *jawr'dĭ* [Scotch dimin. of George]: a guinea. GEORDIE SAFETY-LAMP, safety lamp invented for use in coal mines by George Stephenson.

GEORGE, n. *jŏrj:* a figure of St. George on horseback worn by knights of the Garter. GEORGE-NOBLE, English gold coin, current at six shillings and eight pence in the reign of Henry VIII.; so called from the figure of St. George on the reverse.

GEORGE I. (GEORGE LOUIS), King of Great Britain 1660, Mar. 28—1727, June 10 or 11 (reigned 1714–27): son of Ernst August, Elector of Hanover, and of Sophia, a granddaughter of James I. of England. According to the theory that the blood of James II. in the direct line was 'corrupted,' he was the nearest heir to the crown. On the death of Queen Anne, 1714, July 31, he was instantly proclaimed king, and arrived in Britain from his electorate of Hanover at the age of 54. To him Britain was to the last a foreign country, for which he had no love, and of whose language, feelings, and thought he was profoundly ignorant. His affections remained with Hanover, but to Britain his alliances, experience, and fair abilities for business, resolutely exercised, were of considerable value. A king of more brilliant abilities might have been an impediment in the way of constitutional government adjusting itself to habits of domestic peace and order after the dethronement of the Stuarts, whose ruined fortunes excited the pity of the people, and afforded a convenient cry for the minority that declaimed in private, and wrote songs, and plotted against the imported king, whom they called a 'foreign tyrant.' Supported by the whigs, and undisguisedly partial to them, George was an object of dislike both to tories and to jacobites, and they associated together to bring about a revolution. In Scotland, 1715, the Earl of Mar raised the standard of rebellion; and he had collected about 10,000 men, when he engaged the Duke of Argyle with about half that number of men at Sheriffmuir, near Dunblane. It was a drawn battle, the left wing of both armies being victorious; but to the rebels it was not a victory, and it caused delay and checked their progress, and that was equivalent to a defeat, for the Highlanders, seeing little prospect of fighting and plunder, returned home; and in that part of the island the rebellion

may be said to have burned out of itself. In England, it did not succeed so well; and it was ended miserably by the unconditional surrender of the insurgents at Preston. For this outbreak the Earl of Derwentwater and Viscount Kenmure were beheaded on Tower Hill, several officers were shot, many persons of distinction were attainted, about 30 of the less conspicuous rebels suffered death, and more than 1,000 were transported to the plantations. The Earl of Mar and the Pretender both escaped to France.

The next most notable and calamitous event of this reign was the failure of the South Sea Company (q.v.). A quarrel with the Spaniards began 1726, which issued in a somewhat unsuccessful expedition of Admiral Hosier to their American possessions, and a fruitless attempt on Gibraltar (q.v.) by the Spaniards. In 1727, George I., who had, amid the splendors of British royalty, sighed for his fatherland and his family, set out for Hanover, and died of apoplexy on the way to visit his brother, the Bishop of Osnabrück, on the night of June 10th or the morning of the 11th. His life was not happy. His wife, who was his cousin Sophia Dorothea of Zell, to whom, after the fashion of the low profligacy then prevalent in the German courts, he was untrue, had solaced herself by yielding to the attentions of Philip von Königsmark. 1694, July 1, the latter disappeared forever in a mysterious way, and Dec. 28 Sophia was divorced. The remaining 32 years of her life she spent as a prisoner in the fortress of Ahlden, where she died at the age of 60. The credit for various wise measures of public policy during the reign of George I. is due not so much to the king as to his prime minister in the later years, Sir Robert Walpole (q.v.). There are clear glimpses of George I. in Carlyle's *Life of Frederick the Great.* Carlyle commends his talent for silence, and thinks him, in spite of appearances, a man of more human faculty, 'chiefly of an inarticulate kind,' than he generally gets credit for. His daughter Sophia Dorothea (1687–1757) married 1706, Frederick William, afterward king of Prussia: she was mother of Frederick the Great.

GEORGE II. (George Augustus), King of Great Britain: 1683, Oct. 30—1760, Oct. 25 (reigned 1727–60); b. Hanover; only son of George I., whom he succeeded on the throne. He married Carolina Wilhelmina, daughter of the markgraf of Anspach. She is said to have been a woman of uncommon attainments in literature, theology, and politics, and her death in 1737 was reckoned a public loss. The king himself did not aspire to a code of morals different from his fathers, nor to any intellectual accomplishments except those of a soldier. He was present at the battle of Dettingen 1743, and with the assistance of the Earl of Stair he gained it: the French being entirely defeated, and very efficient service rendered to Maria Theresa of Hungary, who had besought aid against the partition of her dominions. The king's second son, the Duke of Cumberland, was not so fortunate, for the English forces under him were defeated with great loss 1745,

at Fontenoy by the French under the famous Marshal Saxe. In the same year Prince Charles Stuart, son of the old Pretender, landed in Scotland with seven officers, and arms for 2,000 men. After some transient success, he was completely defeated at Culloden, 1746, Apr. 16, and what is known as the *Second Rebellion* was brought to an end. (See STUART, CHARLES EDWARD). The Duke of Cumberland, whose barbarities in the suppression of the insurrection earned him the name of the 'Bloody Butcher,' returned to the command of the English forces on the continent, and was repeatedly beaten by Marshal Saxe and the French; much that Marlborough had gained being lost. In India, Colonel, afterward Lord, Clive gained various victories, the chief being the victory at Plassey 1756, which laid the foundations of the British E. Indian Empire; and during the next three years the British dominion in N. America was extended and strengthened by the victory of Wolfe on the heights of Abraham, and the subsequent surrender of Quebec. British allied troops contributed to the Hanoverian victory at Minden 1739. Generally the reign of George II. was prosperous: according to Hallam, 'the most prosperous period that England had ever known;' and this, not less from the acquisiton of new territory, than from the conquest of new fields of thought effected by Pope, Hume, Samuel Johnson, Fielding, Smollet, Reynolds, Hogarth, and many others. During this reign the comparative power of the monarchy among the forces of the British government was reduced. The king was economical, methodical, mechanically regular, with no capacity beyond the petty details of business.

GEORGE III. (GEORGE WILLIAM FREDERICK), King of Great Britain: 1738, June 4—1820, Jan. 29 (reigned 1760–1820); son of Frederick Lewis, Prince of Wales (1707–51) and grandson of George II., whom he succeeded on the throne. His reign was eventful as well as long. 1761, Sep. 8, he married Princess Charlotte Sophia, daughter of Charles Duke of Mecklenburg-Strelitz, and was by her the father of 15 children. His intellect was not of the strongest, but, like his two predecessors, he had tenacity of purpose, with a conscientiousness and sense of decorum unknown to them; while both friends and enemies could rely on him—the friends for favors, the enemies for opposition. His mind gave way several times—in 1764, 88, 1801, 04, and 1810, when the British were fighting behind the lines of Torres Vedras, his final insanity supervened. He had abundance of cares, like most sovereigns. The *Letters of Junius* and the invectives of Wilkes annoyed him; so did the proposals to emancipate the Rom. Catholics and the terrible French Revolution of 1789. His life was attempted by the maniacs Margaret Nicolson and a man named Hatfield. The marriages of two of his brothers with the widows of subjects displeased him, and led to the passing of the Royal Marriage Bill, 12 Geo. III. c. 11, prohibiting members of the royal

family from contracting marriage without the consent of the king, if under twenty-five years of age, and consent of parliament if older; and afterward the undoubted debts and dissipation of his eldest son (who became George IV.), with his hardly doubtful marriage with Mrs. Fitzherbert, Rom. Cath. widow of two husbands, and the scandals of his public marriage with his cousin, Caroline of Brunswick, must have led the 'good old king' to reflect that not even a 'marriage bill' could cure all the domestic miseries of monarchs. Matters of national excitement and magnitude were not lacking. A bill, imposing certain stamp-duties upon the American colonies, which had been resolved to be inexpedient 1764, was passed 1765, March, and repealed 1766 by the Marquis of Rockingham's ministry; and 1767 the chancellor of the exchequer, Mr. Townshend, brought forward a plan for the taxation of these colonies, which led to their revolt, the colonies naturally objecting to be taxed by a parliament in which they were not represented. In 1770, Lord North, the premier, brought in a bill for the repeal of all the recently imposed American duties, except the duty on tea, which was retained to assert the English right to impose taxes on these colonies. In 1773, Dec., 'Boston harbor is black with unexpected tea,' cargoes of it being destroyed by the colonists; and 1775, Apr. 19, hostilities commenced with the indecisive battle of Lexington, followed June 16, by that of Bunker Hill, which was a victory to the colonists, and helped to give them boldness to renounce the dominion of Great Britain and publish the Declaration of Independence 1776, July 4. George Washington, col. of militia, who had been appointed gen. of the insurgent colonists, took possession of Boston in that year, having compelled Gen. Howe and the British troops to retire, and next year he gained an important advantage by the capture of Burgoyne's army of 10,000 (some accounts give a smaller number) fine troops, British and German. The French, Spanish, and Dutch all threw their weight into the American scale, and the checkered and disastrous struggle ended in America by the surrender of Lord Cornwallis, with a British army of 6,000 men, to Washington and the Marquis de la Fayette. The French suffered at sea by the gallantry of the British under Byron, Hood, and Rodney, the last having, in the W. Indies 1782, obtained over them a naval victory by the previously untried method of breaking the enemy's line. In that year, also, Gen. Elliott repulsed the grand attack of the French and Spaniards, and put an end to their chances of success in the obdurate siege of Gibraltar. At Versailles, 1783, Sep. 3, a peace was concluded with France and Spain, in which the independence of the American States was recognized, not a little to the satisfaction of many of the English people, who, besides being tired of the struggle had throughout the contest sympathized with the American colonists, whose cause, originally good, had had its merits kept before the public mind by the eloquence of

Chatham, Fox, and Burke, three of the greatest political orators of all time. The king, always inflexible and plain-spoken, had held out to the last against the loss of his colonies. To John Adams, first minister of the United States accredited to him, he said:—'Sir, I wish you to believe, and that it may be understood in America, that I have done nothing in the late contest but what I thought myself indispensably bound to do by the duty which I owed to my people. I will be very frank with you. I was the last to consent to the separation; but the separation having been made and having become inevitable, I have always said , as I say now, that I would be the first to meet the friendship of the United States as an independent power.'

Meanwhile, the British rule in India was consolidated, largely under the gov.-generalship of Warren Hastings, a most able but somewhat unscrupulous man. His trial for misrule and oppression, famous for the eloquent accusations of Burke and Sheridan, began 1786, and was protracted for nine years. Wars with Hyder Ali and his son Tippoo Saib were ended by the storming of Seringapatam 1799.

The after-swell of the French Revolution broke over all the continent of Europe in wave after wave of war. The aversion of Britain to the insane democracy of France was not concealed, and 1793, a few days after the execution of their king, the French declared war against Britain. In the confused warfare that followed, the English under Lord Howe, 1794, defeated the French fleet in the Channel; under Sir John Jervis they defeated the Spanish fleet off Cape St. Vincent 1797; also in that year, under Lord Duncan, they defeated the Dutch off Camperdown; and 1798 Nelson was victorious on the Nile over the French fleet that had conveyed Napoleon Bonaparte and his troops to Egypt. In 1801, Nelson bombarded Copenhagen and partially destroyed the Danish fleet; and the forces under Sir Ralph Abercromby—who was mortally wounded—gained the victory of Alexandria over the troops which Napoleon had left in Egypt to menace the power of Britain in the East. 1802, March 25, the treaty of peace of Amiens was signed, but, within a year, hostilities were renewed. In 1803, Hanover was occupied by the French. 1805, Oct. 21, Nelson lost his life and gained his greatest victory, at Trafalgar over the French and Spanish fleets. Napoleon's splendid victory of Austerlitz over the Austrians and Russians, 1805, Dec., was survived only a few weeks by the great statesman Pitt, whose broken constitution and breaking heart could not sustain the shock of this last disappointment. Napoleon's Berlin decree 1806, and his Milan decree 1807, declaring the British dominions in a state of blockade on purpose to destroy British commerce, were not supported by a sufficient navy to carry them into execution by capturing vessels trading with Britain; but they did considerable damage. In 1808, Sir Arthur Wellesley landed in Portu-

gal, and defeated the French at Vimieira; but the advantage of this victory was thrown away in the Convention of Cintra. Four months later, the retreat, to Corunna of the English army under Sir John Moore, from overwhelming odds, and its safe embarkation, 1809, Jan., after the repulse of Marshal Soult, has secured a reputation for the general who fell there hardly inferior to that of those who had died in the moment of victory. In April of that year, Sir Arthur Wellesley returned to the command in the Peninsula, and after conquering at Talavera July 8, wearing out the powers of the assailing French behind the lines of Torres Vedras during the last months of 1810, and conquering at Fuentes de Onoro 1811, Salamanca 1812, Vittoria 1813 (as Lord Wellington), and in other battles and sieges, he drove the French out of the peninsula. The long and stupendous struggle was terminated on the eventful field of Waterloo (q.v.), 1815, June 18.

Ireland was united to Great Britain, 1801, Jan. 1, and its separate legislation was abolished. During this reign many Scotchmen had made their way to the first places in the state; all of the Jacobite feelings had died out; and the Union had become not legislative merely, but also of society, literature, thought and enterprise. The most original and vigorous thought of this period found its expression in poetry, and most noteworthy among its poets are Byron, Coleridge, Wordsworth, and Walter Scott, the last of whom is at the head also of the writers of prose-fiction in this reign. In spite of the depressing effects of war, commerce greatly increased during the 60 years of this reign; and the revenue, which at the beginning was under nine millions sterling, had, during the years of the French war, been increased more than sevenfold, thus showing, though by an undesirable method, the vast increase of the resources of the country. Chemistry and the steam-engine were beginning to alter the face of society. Among legislative reforms, the most conspicuous was the abolition of the punishment of death for minor crimes; and generally the statute-book, which had greatly increased, became more and more favorable to individual liberty.

The abilities of the prime-minister Pitt, gave this reign a glory which cannot be credited to the king. The king was a man of routine, without brilliancy of mind, without literary or artistic taste. But the purity of his domestic life in contrast to the disgraceful profligacy of his predecessors should be counted as a high honor to his name, as it was also a help to national morality.—His fourth son, Edward Augustus, Duke of Kent (1767–1825) was father of Queen Victoria.

GEORGE IV. (George Augustus Frederick), King of Great Britain: 1762, Aug. 12—1830, June 26 (regent 1811–20, reigned 1820–30): son of George III. That he should have lived so long as 67 years is not the least notable fact of a life that has supplied as much foul material for

scandal as any in English history. George had considerable intellectual ability and address, could tell stories well, and enjoy every day without thinking of the next. His personal attractions and a singular ease and graciousness of manner, led many in his lifetime to style him 'the first gentleman of Europe;' but the decay of king-worship, and the growth of morality, have either made that appellation absurd, or have changed the compliment to a bitter irony. His vices and those of some of his royal namesakes, have been mercilessly exposed by Thackeray in his 'Four Georges' (1861). George IV. was false and heartless, grossly licentious and profligate, and wildly extravagant as a gambler and for his sensual pleasures. At the age of about 25 he received from the government a sum equal to about $800,000, for payment of his debts, having had an annual income of about $250,000. Before this time he had married (fictitiously) Mrs. Maria Fitzherbert (q.v.), whom he repudiated, and to whom he returned after his separation from his lawful wife; the woman was afterward compelled to leave him on account of his excesses.

His lawful marriage was specially unfortunate. He entered into it 1794, Apr. 8, with his cousin, Caroline Amelia Elizabeth, second daughter of the Duke of Brunswick, under the pressure of debt, and of his father's promise of financial help, as a condition. Their conjugal happiness, if it ever existed, did not last many weeks. The Princess Charlotte Augusta was born of the marriage 1796, Jan. 6; and shortly afterward her parents separated, having ceased to speak to each other months before: See CAROLINE, AMELIA ELIZABETH. The princess Charlotte married Prince Leopold, afterward king of Belgium; and died 1817, Nov. 6, greatly to the grief of the whole nation.

Royal visits to Scotland and Ireland; the aid rendered to the Greeks by the British fleet in the battle of Navarino –1827) which secured the independence of Greece; and the passing (1829) of the Rom. Cath. Relief Bill (q.v.) (so odious to his father), are the most notable incidents of this king's reign. He was succeeded by his brother William, Duke of Clarence, who had entered the navy in his youth.

GEORGE V. (GEORGE FREDERICK ERNEST ALBERT), King of the United Kingdom of Great Britain and Ireland, and of the British Dominions beyond the Seas; Emperor of India; Defender of the Faith: second son of Edward VII.; b. at Marlborough House, London, 1865, June 3. He entered the navy as a cadet in 1877. After two years on the training-ship *Britannia*, the young prince started on a three years' cruise around the world on the *Bacchante*. In 1883 he was made midshipman, and promoted to lieutenant in 1885. In 1890 he was given separate command of the gun-boat *Thrush*, and the following year was made commander. In 1892 (Jan.) there died his elder brother Albert Victor, Duke of Clarence, and Prince George was now in direct line to the throne, taking his seat in the House of Lords, as the Duke of York. On

July 6, 1893, he married the Princess Victoria Mary of Teck, who had been betrothed to the Duke of Clarence. The first child born of this marriage, Prince Edward (1894, June 23), is heir to the British crown. After his marriage the Duke of York continued his naval career. For some time he was in command of the *Crescent* attached to the Channel squadron. He was promoted to the rank of rear-admiral on Jan. 1, 1901, and was appointed Colonel in Chief of the Royal Marine Forces. Shortly after the death of Queen Victoria, which occurred Jan. 22, 1901, the Duke and Duchess of York started on a tour of the Colonies, the chief object being to open the first parliament of the Commonwealth of Australia. It was intended that their royal highnesses should perform the same function for the first parliament of the Union of South Africa in the summer of 1910, a plan which was prevented by their accession to the throne in May of that year. The return of the duke to England in Nov., 1901, was signalled by conferring upon him the title of Prince of Wales, which his father had so distinguished. The life of the Prince of Wales was comparatively uneventful, as, possessed of domestic tastes, and a retiring disposition, he was never eager for an active part in public affairs. In 1902 he was promoted to the rank of general, and in 1905 appointed Lord Warden of the Cinque Ports. In 1905-06 he made a memorable visit to India, in continuation of the policy of welding together, and awakening a common interest in, the scattered parts of the great empire. On the death of Edward VII., 1910, May 6, George ascended the British throne.

King George is closely related to a large number of European royalties. He is a brother of the Queen of Norway, nephew of the King of Denmark, and King of Greece; first cousin of the Emperor of Germany, Czar and Czarina of Russia, King of Norway, Queen of Spain, Duke of Saxe-Coburg, Grand Duke of Hesse, Crown Princess of Sweden, and Crown Princess of Greece.

GEORGE I. (Christian William Ferdinand Adolphus George), King of Greece: b. 1845 (began reign 1863); second son of the king of Denmark; and brother of Alexandra, Queen of England and of Mary Feodorovna, formerly Princess Dagmar, Empress of Russia. He served in the Danish navy, and after the popular tender of the crown of Greece had been declined for political reasons by Prince Alfred of England, and by Duke Ernest of Saxe-Coburg Gotha, George accepted it with the consent of the great powers. He relinquished his rights in Denmark, was permitted to remain a Lutheran on a pledge that his children should be brought up in the Greek faith, was crowned as King of the Hellenes, and married to the Grand Duchess Olga, niece of the late emperor Alexander II. 1867, Oct. 27.

GEORGE (the Bearded), Duke of Saxony: 1471–1539 (ruled 1500–39); eldest son of Albert (the Brave), who was the founder of the Ducal or Albertinian Saxon line. He early showed strong desire for religious knowledge, and 1484 was sent to Meissen to study for the priesthood. On the death of his father, 1500, G. succeeded to the whole dukedom, consisting of the half of Thuringia and Meissen, except the lately acquired country of Friesland, which fell to his younger brother Henry; who, however, soon after exchanged it with George for Frieberg and Wolkenstein. Though G. and William, Duke of Lower Bavaria, were the two pillars of Rom. Catholicism in Germany, yet G. did not appear much displeased with the proceedings of Luther previous to the Leipsic controversy; on the contrary, they were at one in regard to the many abuses which had crept into the church, but George wished to remedy them through papal edicts, or the decisions of a general council. The ill-feeling between G. and Luther began during the Leipsic controversy, from a misapprehension of Luther's doctrine of justification by faith; it necessarily increased in strength in a man remarkable for obstinacy, especially as it was carefully fostered by John Eck and others of Luther's enemies. Yet when the emperor seemed likely to violate his safe conduct given to Luther, George strongly protested against such a breach of good faith. The latter years of his reign were imbittered by a succession of domestic calamities: first his wife died, then all his children in succession; thus his brother, Henry of Freiburg, a zealous Protestant, became heir-apparent; and such was George's antipathy to being succeeded by one of that religion, that he attempted to break the line of succession, but did not live to do so. He was succeeded by Henry.

GEORGE, Prince of Denmark: 1653–1708; second son of Frederick III., and husband of Queen Anne of England. He fought in person, with his brother Christian V., against Charles XI. of Sweden on the renewal of the war after his father's death 1670; married Princess Anne 1683, July 28, who bore him 17 children, all of whom died before her accession; was naturalized and created Duke of Cumberland after the triumph of the Prince of Orange; accompanied the king to Ireland and took part in the battle of the Boyne; and on the accession of his wife to the throne 1702 was made generalissimo of all the queen's forces and lord high admiral of England.

GEORGE, Prince: second son of George I., King of Greece; b. in Corfu, Ionian Islands, 1869, June 24; was made lieut. in the Greek army, 1889, July 19. In 1891 while traveling in Japan with his cousin, the Grand Duke of Russia (afterward Nicholas II.), he saved the latter from assassination at the hands of a religious fanatic. Was high commissioner of Crete, 1898–1906.

GEORGE, Henry: political economist: 1839, Sep. 2 — 1897, Oct. 29; b. Philadelphia; son of an Episcopalian book-publisher. He attended the common school, and had the benefit of one year at high school before he was 13

years of age. Then he served as office-boy in a crockery-store, and at the age of 14 went to sea as cabin-boy on the ship *Hindoo*, sailing for London, Melbourne, Calcutta, and back to New York. After his return home he learned to set type in his father's printing-office, but left the trade in 1858 to become a sailor before the mast on a ship that sailed around the Horn to California, where, in Sacramento and San Francisco, he worked as a compositor, and in the latter place became a reporter, writing for the *Journal* and the *Herald*. Afterward he became editor of a small paper in Oakland, and subsequently managing editor of the Sacramento *Recorder*. While editing this paper he was in harmony with the democratic party, but bitterly opposed to the railroad and other monopolies in the state; and when a candidate for the assembly 1869 was not only defeated but lost his paper by the sale of its controlling stock interest through railroad influence. He kept up his editorial connections in Sacramento and San Francisco till 1876, when he was appointed state inspector of gas meters for a term of four years, and just before its expiration he became a trustee of the Free Public Library of San Francisco. His first publication on the subject of land-ownership was *Our Land and Land Policy* (San Francisco 1871). The attention which this attracted led him to a very detailed and laborious investigation into the causes of industrial depressions and the increase of want with the increase of wealth. In 1879 he published the results of his investigations under the title *Progress and Poverty*. Of the origin of this work he has given an interesting account, to the effect that while out driving one day in the neighborhood of Oakland he casually asked a passing teamster what land was worth there. The teamster replied that he thought some might be purchased for $1,000 an acre. 'Like a flash,' says the author, 'it came upon me that with the growth of population land grows in value, and the men who work it must pay more for the privilege. I turned back, amid quiet thought. The perception that then came to me has been with me ever since.' In 1880 George removed to New York. His book gained an immediate and wide reputation, and within a few weeks after his arrival in New York he was in receipt of requests from all parts of the country to give public expositions of his theories. The same year he went to Ireland as correspondent of the *Irish World* of New York, and spent a year abroad, studying the land question in Ireland and lecturing for the English Land Restoration Soc. in England. His third book, *The Irish Land Question*, was published 1881. In the winter of 1884–5 he lectured in Scotland for the Scottish Land Restoration Soc., and afterward spoke in nearly every important city and town in Great Britain. His *Social Problems* appeared 1883, *The Land Question*, 1884, and *Protection and Free Trade* in 1886. Returning to New York and resuming lecturing, his views were adopted by the United Labor party, which made him its candidate for mayor of the

city 1886. He received 68,110 votes against 90,552 for Abram S. Hewitt, democrat, and 60,435 for Theodore Roosevelt, republican. He made a vigorous campaign and was joined in it by the Rev. Edward McGlynn, D.D., rector of St. Stephen's (Rom. Cath.) Church. After the election he founded the *Standard,* a weekly newspaper, and, with Dr. McGlynn, the Anti-poverty Soc. In 1886, Dec., Dr. McGlynn was suspended, and 1887, Jan., excommunicated by the Rom. Cath. authorities for acts and utterances originating in his support of George's candidacy and theories. In 1887, George was nominated by the United Labor party, for Sec. of State of N. Y., and received 37,377 votes against 111,248 for Frederick Cook, the successful democratic candidate. In 1891 George published *The Condition of Labor,* an open letter to Pope Leo XIII. in reply to his encyclical on the labor question. George was nominated 1897 for mayor of New York by several independent democratic organizations which fused under the name of the Jeffersonian Democracy. He accepted the nomination, and entered the campaign against his opponents with extreme ardor. The stress of the fight was too great for his physical organism, and in the early morning of Oct. 29 he was stricken with apoplexy and died in a few hours. All parties united in tributes of respect to the dead, and his body lay in state. Henry George, Jr., was nominated for mayor in place of his father. He has written a biography of his father. Shortly after George's death there appeared a work of his pen entitled *The Science of Political Economy.* See TAX; TAX, SINGLE.

GEORGE, LAKE: picturesque body of water in Warren and Washington counties, N. Y., 310 ft. above tide-water, 36 m. long, n.e. to s.w., 1 to 4 miles wide, greatest depth 400 ft.; with outlet to Lake Champlain. It was known to the Indians as Caniaderiot and afterward as Lake Horicon. It is noted for the beauty of its surrounding scenery, the clearness of its water, the number and charm of the islands that dot its surface, its historical associations and popularity as a summer resort and camping ground. On the e. shore Black Mountain rises to a height of 2,200 ft. above it, and 12 m. distant is the steep rock 200 ft. high, down which Maj. Rogers slid to safety when pursued by Indians in the French war. Close by is the spot where Lord Howe's army landed prior to its attack on Fort Ticonderoga. Steamers ply on the lake in summer for the convenience of tourists, its shores are dotted with numerous hotels, and many camping parties are seen on its banks and islands every season. The lake was discovered early in the 17th c., visited by Champlain 1613, named Lake St. Sacrament 1646, occupied by large armies in the French and Indian war, and was the scene of several battles and important military movements. Fort William Henry was erected by the English near the head of the lake 1755, and Fort George, ½ m. e., 1759. See DIESKAU, LUDWIG AUGUST: FORT WILLIAM HENRY AND FORT GEORGE.

GEORGE OF CAPPADOCIA: Arian abp. of Alexandria: b. abt. the beginning of the 4th c.; d. 361, Dec. 24; son of a fuller. Some authorities make him a native of Epiphania in Cilicia; but a larger number agree that he was a Cappadocian. Though regarded as a type of extreme meanness, he was possessed of abilities and powers of insinuation that enabled him to secure a contract for supplying provisions to the army; but in executing it he was guilty of such imposition that he was nearly killed by the soldiers and forced to flee. Subsequently he settled in Constantinople and became wealthy as a receiver of taxes. There is no record of his admission to holy order, nor of his having held any subordinate ecclesiastical office; but after the banishment of Athanasius 356, George secured the vacant see through the influence of the Arians. His tyranny led his friends to put him into prison for safety, and after the accession of Julian, he was dragged out by the populace and killed, his body being burnt and his ashes cast into the sea. He collected a valuable library which Julian appropriated. He has some times been confused with St. George (see GEORGE, SAINT).

GEORGE OF TREBIZOND: 1396–1486; b. Chandace, island of Crete: scholar and philosopher. In 1430 he was invited to Italy by Francesco Barbaro, a noble Venetian, and was soon appointed prof. of Greek literature and philosophy in Venice. Later, Pope Eugenius IV. induced him to accept a similar post in Rome, to which was added that of pontifical secretary. He held both appointments through Eugenius's life and was continued in them by Nicholas V. He eulogized Aristotle, attacked Plato, and translated several of the Greek authors into Latin in such a thoughtless and hasty manner as to provoke bitter criticism, draw out a spirited response from Cardinal Bessarion (q.v.) and compel him to seek protection at the court of Alphonso V. at Naples.

GEORGE (known as PISIDES or PISIDA): Byzantine historian and poet of the 7th c.; also deacon and officer of the church of St. Sophia, Constantinople. Little is known of his personal history but he left detailed chronicles of the first expedition (622) of the emperor Heraclius against the Persians, an account of Avari's unsuccessful attack on Constantinople (626), a survey of the military operations of Heraclius till the overthrow of Chosroes (627), a poem on the creation of the world, a controversial composition against Severus of Antioch, two poems on the resurrection of Christ and the Virgin's temple at Blachernæ, and an encomium in prose on Anastasius the martyr. Other works ascribed to his pen are not extant.

GEORGE, ST.: one of the Bermudas or SOMERS' ISLANDS, British possessions in mid-Atlantic. It has a picturesque capital, plentifully supplied with hotels and stores. Owing to its temperate climate St. George has become a popular holiday as well as winter resort, especially for Americans. Though the soil is generally poor, large quantities of garden produce are raised. It is strongly

fortified and forms the principal military depôt in the group. On the s. coast is the town of St. George which has a large harbor, with fortifications.

GEORGE, SAINT: soldier: b. in Cappadocia; supposed to have been put to death as a Christian martyr, 303, Apr. 23, on which day his festival is observed by the whole Roman Church. This saint is venerated in both the Eastern and Western churches, held in special honor as the patron of Chivalry, and adopted as the tutelary saint of England. His origin is extremely obscure; and the very oldest accounts of him extant contain a strange mixture of history and legend. The Greek acts of his martyrdom fix the date of his death as the persecution under Diocletian; but these acts are, by the confession even of Rom. Cath. hagiologists, undoubtedly spurious. On the other hand, it is asserted (see Gibbon's *Decline and Fall*, II. 323) that the canonization of George is one of the many errors which Prot. historians freely impute to the Roman calendar, and that the George who is thus reputed a saint and martyr is no other than the turbulent and unscrupulous Arian partisan, George of Cappadocia (q.v.), whom his Arian followers revered as a saint, and imposed as such on the credulity of their Cath. countrymen. It must be confessed, however, that the best modern authorities, Rom. Cath. and Prot., agree in admitting the great improbability of this allegation. Heylin is of one mind in this matter with the Jesuit Papebroch, and Dean Milman adopts the arguments and agrees in the opinion of the Rom. Cath. Bishop Milner. The truth is, that whatever is to be said of the early accounts of the martyrdom of George, the fact of his being honored as a martyr by the Catholic Church, of churches being dedicated to him, and Hellespont being called, 'St. George's arm,' is traced by Papebroch, by Milner, and by other writers to so early a date, and brought so immediately into contact with the times of the angry conflicts in which George of Cappadocia figured as an Arian leader, that it would be as reasonable to believe that the Rom. Catholics of England at the present day would accept Lord George Gordon as a Rom. Cath. saint, as to suppose that the Catholics of the East—while the tomb of Athanasius was hardly closed upon his honored relics—would accept as a sainted martyr his cruel and unscrupulous persecutor. Indeed it cannot be doubted that the St. George of the Eastern Church is a real personage, and of an earlier date than George of Cappadocia—probably of the date to which these acts, though otherwise false, assign him. The legend of his conflict with the Dragon arose probably out of symbolical or allegorical representation of his contest with the pagan persecutor. As in this ancient legend St. George appears as a soldier, he was early regarded as one of the patrons of the military profession. Under this title, he was honored in France as early as the 6th c.; but it was not until after the Crusaders, who ascribed their success at the siege of Antioch to his intercession, returned to Europe from

the Holy War, that the religious honor given him reached its full development. He was selected as the patron saint of the Republic of Genoa and of England. At the council of Oxford, 1222, his feast was ordered to be kept as a national festival. In 1330, he was made the patron of the Order of the Garter by Edward III.; and even since the Reformation, the ancient sentiment is still popularly maintained.

GEORGE, St., Banner of: white with a red cross. According to Sir N. H. Nicolas, the cross of St. George was worn as a badge over the armor by every English soldier 'in the 14th and subsequent centuries, even if the custom did not prevail at a much earlier period,' to indicate that he was in the service of the crown. On the invasion of Scotland by Richard II., 1386, it was ordained 'That everi man of what estate, condicion, or nation they be of, so that he be of oure partie, bere a signe of the armes of Saint George, large, bothe before and behynde, upon parell that yf he be slayne or wounded to deth, he that hath so doon to hym shall not be putte to deth for defaulte of the crosse that he lacketh. And that non enemy do bere the same token or crosse of St. George, notwithstandyng if he be prisoner, upon payne of deth.' A similar ordinance was adopted by Henry V. for his army in France.

GEORGES, *zhorzh*, Marguerite Josephine: 1787, Feb. 23—1867, Jan. 12; b. Bayeux, France: actress. She was daughter of an actress and of a tailor, was educated for the stage in Paris, and made her first appearance there as *Clytemnestra*, 1802. Her acting and beauty made a great sensation, and after a vain attempt to supplant Mlle. Duchesnois she went to Russia, where Emperor Alexander I. became infatuated with her. She played as Dresden and Erfurt before the emperor and Napoleon, was induced by the latter to return to France, was readmitted to the Theatre Français 1813, and was paid her salary from 1803, was further trained by Talma, and again broke her engagement 1816. She played in England, Germany, and the French provinces, at the Odéon and Porte St. Martin theatres, Paris, 1821–47, retired 1855, and found it necessary to teach in the conservatory for a living.

GEORGE'S CHAN'NEL, St.: south portion of that arm of the Atlantic which separates Ireland from the United Kingdom. A line, extending from Holyhead in Wales to Dublin, would form the n. limit of this channel; and a similar line from St. David's Head to Wexford, its s. limit. At its n. extremity it is 64 m. wide, and at its s. about 62 m.; length, from n.e. to s.w., is about 100 miles.

GEORGETOWN: a separate city till 1878, when it was made a part of Washington; in the District of Columbia, on a range of hills, the highest of which are denominated the *Heights*, on the left bank of the Potomac, two m. n.w. of the capitol. From the Heights, occupied by elegant villas, a magnificent view

of the whole of Georgetown and Washington, and of the surrounding country, is obtained. Georgetown is quiet and antiquated, and has a reputation for literary advantages and refined society. Its principal institutions are the Georgetown College, under the management of the Jesuits, and the convent of Visitation Nuns —attached to which is an academy for girls with about 100 pupils. Here the Alexandria branch of the Chesapeake and Ohio canal is carried across the Potomac on an enormous viaduct 1,446 ft. long, 36 ft. above the ordinary level of the water. As it is the only port in the district of Columbia, and at the head of the navigation of the Potomac, 125 m. from its mouth, its foreign commerce and coasting trade are important. It has 50 mills to supply its trade in flour. It is one of the greatest markets in the United States for shad and herrings, of which vast quantities are caught in the Potomac, and brought here for barrelling. See WASHINGTON (city).

GEORGE'TOWN (Dutch, *Stabroek*): capital of British Guiana, at the mouth and on the right or eastern shore, of the river Demarara; lat. 6° 49′ 20″ n., and long. 58° 11′ 30″ w. It is handsomely built, and has spacious, clean streets, intersecting at right angles, with neat wooden houses which have open verandas in front and are embosomed in trees, of which the cabbage-palm, cocoa-nut and orange-tree are the chief. Some of the streets are traversed by canals, communicating with each other and with the river. The principal public buildings are the town-hall, an elegant structure, with marble-paved galleries resting on cast-iron columns, the Episcopal cathedral, and the Colonial Hospital. There are also a mariners' hospital, numerous churches and schools, astronomical and botanical societies, barracks, theatres, and a market-place surrounded by well-stocked shops. Georgetown, owing to the low and swampy character of the district, is unhealthful. Yellow and intermittent fevers, diarrhea, and dysentery are local diseases. The chief exports of Georgetown are sugar, coffee, and rum; and its annual trade employs about 600 vessels of 102,000 tons burden. A new almshouse for the poor has been erected, and all the settled parts of the colony have been connected with Georgetown by telegraph. Pop. 53,176, most of whom are negroes and people of color.

GEORGETOWN UNIVERSITY, D. C., an institution of higher education, under the direction of the Roman Catholic Church. The plan of the institution was undertaken as early as 1785 by the Rev. John Carroll, later first archbishop of Baltimore. In 1786 the corporation of clergymen in the chapter held at Whitemarsh, Md., adopted a series of resolutions directing the establishment of the institution and the erection of its first building. The year 1789 is generally considered the year of the foundation of the university, though students were not received until 1791. Upon the reorganization of the Society of Jesus in Maryland in 1805, the Georgetown

College, as it was then called, was transferred to that society, under whose direction it still remains. In 1815, the university was empowered by acts of Congress to confer any degree in the arts, sciences, and liberal professions, which are conferred in other colleges and universities, and, in 1833, the Holy See empowered the university to confer, in the name of the Church, degrees in philosophy and theology. The university is composed of the college; the school of medicine, organized in 1851 and including since 1901 a school of dentistry; and the school of law, organized in 1870. The college comprises three distinct departments, the graduate school, the undergraduate department, and the astronomical observatory. A preparatory department is also connected with the university. The teaching of the university is guided by the principles of the Ratio Studiorum, formulated by the Jesuit order, and a strict standard of scholarship is maintained. The facilities of the university include the Coleman Museum of Natural History, the Beauchamp Hughes Art Cabinet, and the Riggs Memorial Library. The U. has a faculty of 150, and about 900 students.

GEORGE WASHINGTON UNIVERSITY, THE (formerly Columbian), a non-sectarian university with graduate departments for post graduate and professional studies, and colleges conducting undergraduate, technical, and specialized work, located in Washington, D. C.; organized by special act of Congress in 1821 and by special amendatory acts of Congress. The University is divided first into departments for graduate work: a department of arts and sciences leading to the masters' degrees and the degree of doctor of philosophy; a department of politics and diplomacy, leading to the degrees of master of diplomacy and doctor of philosophy; a department of medicine comprising a four-year course, leading to the degree of doctor of medicine, and a three-year course leading to the degree of doctor of dental surgery; a department of law and jurisprudence with a three-year course leading to the degree of bachelor of laws, a fourth year additional leading to the degree of master of laws, a graduate course of one year leading to the degree of master of patent law, and a three-year course for graduate students in arts and law, leading to the degree of doctor of jurisprudence; Columbian College for undergraduates with courses leading to the degrees of bachelor of arts and bachelor of science; Washington College of Engineering, with courses for undergraduates leading to the degrees in engineering; and a division of architecture leading to the degrees in architecture.

By an act of Congress amending the charter, approved 1905, March 3, colleges may be organized under the charter of the University upon independent financial foundations, but educationally a part of the University, for educational work in arts, sciences, liberal and technical knowledge. The University has about 200 professors and instructors, and 1,500 students.

GEORGIA, *jawr'jĭ-a:* state; one of the 13 original states of the American Union; lat. 30° 30′—35°n., long. 81°—86° w. of Greenwich, or 4°—9° w. of Washington; bounded n. by Tenn. and N. C., n.e. by S. C., e. by the Atlantic Ocean, s. by Fla., and w. by Ala.; extreme length n. to s. 315 m., extreme width e. to w. 250 m.; direct coast line 128 m., coast and islands line 480 m.; area 59,475 sq. m. (38,064,000 acres), of which 495 sq. m. is water surface; named in honor of George II. of England; capital, Atlanta.

Topography.—G. possesses nearly every variety of soil, climate, and scenery common to the entire United States, because of its location and physical features. The s. part is in a pine belt, touches the Atlantic Ocean, and is warmed by the Gulf Stream; the n. part is among the foothills of the Blue Ridge mountains. Between the savannas of the coast on the s.e. and the mountains on the n. are low, pine-covered plains, high level plains, hill slopes, high plateaux, and fertile, picturesque valleys, the surface rising in terraces and showing numerous table-lands. Separated from the coast-line by narrow and shallow sounds are a number of islands, formerly widely known for their production of 'sea-island' cotton, of which Cabbage, Ossabaw, St. Catherine's, Sapelo, St. Simon's, Jekyl, and Cumberland are chief. The Etowah hills in Bartow and Cherokee counties, the Amicolola hills in Gilmer and Lumpkin counties, and the portion of the Blue Ridge mountains ranging with them in Lumpkin, White, and Habersham counties on the s., and Union and Towns counties on the n., constitute the great watershed of the state. This region gives rise to the two principal rivers of G., and was the scene of important military movements in the war of 1861-65. The chief water courses are the Savannah river, the largest in the state, which is formed by the Tugaloo and Keowee, constitutes the boundary between G. and S. C., flows s.s.e. to the Atlantic Ocean, and is navigable for ships to Savannah, for steamboats to Augusta, and for small boats 150 m. beyond; and the Chattahoochee, which rises near the Savannah in the extreme n.e. of the state, flows s.w. and s., takes the name of Apalachicola in Fla., and empties into the Gulf of Mexico. Other important streams are the Altamaha, formed by the Oconee and the Ocmulgee; the Ogeechee, Santilla, and St. Mary's, all of which flow into the ocean; the Flint and the tributaries of the Suwanee, which flow into the Gulf: and the Coosa, Etowah, and Oostanaula, in the n.w. of the state, all of which are navigable. The important water powers of the state are confined mainly to the metamorphic region, where the fall is steep and the rock is solid gneiss that has no pervious strata and no underground caverns to form a subterranean outlet. These streams drain off all the rainfall that is not evaporated, and, as the rainfall is remarkably uniform throughout the year, they can be relied on for constancy of supply. There are four good harbors,—Savannah, Darien, Brunswick, and St. Mary's.

Geology.—The state is divided into four marked geological belts: the Archæan, which includes the mountains and

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Area in Square Miles, 59,475. Population, 2,216,331.

Number of Counties, 145. Capital of State, Atlanta.

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foothills in the n.e. and extends in a s.w. direction across the state; the Paleozoic, which comprises 10 counties in the n.w.; the Mesozoic, which dominates the part about Columbus; and the Tertiary, which covers the lower half of the state. Much of the Archæan belt consists of the Piedmont plains, a rolling-section 700–1,300 ft. above sea-level; the remainder shows crystalline rock. In the Paleozoic are valleys 800–1,000 ft. above sea-level, with numerous ridges and some mountain spurs of 2,000 ft. extreme elevation. The Mesozoic is a triangular belt, showing plains intersected by deep valleys and having a general elevation of about 600 ft. A part of the Tertiary consists of plains 600 ft. above sea-level, but most of it slopes to that level. Fossil remains of extinct mammals, including the mylodon and megatherium, are found in the s.e. savanna region; and the mountainous region contains numerous caves of much interest, picturesque cataracts, and important relics of prehistoric times.

Mineral Resources.— G. has wealth beyond computation in her mineral resources. It is believed that every mineral of economic importance has been found in the state. The upper half abounds in iron ores, coal, marble, slate, corundum, gold, asbestos, and a variety of building stones; in the vicinity of Atlanta is a vast quantity of granite of superior quality; and in the s. section are marls, kaolin, fire-clay, and phosphates in workable quantities. The building stones include marble of various shades, granite, schists, and gneisses, sandstone, varying from gray to brown, and limestone. The marble belt traverses Fannin, Gilmer, Pickens counties, the most valuable quarries being in Pickens county. There are clays suitable for producing the finest pressed brick, vitrified brick, roof and drain tiles, and the coarser grades of earthenware, which are found in the northern part of the state, while south of these deposits are deposits of clays suitable for the manufacture of porcelain, enameled brick, china-ware, terra-cotta, sewer-pipes, etc. In the crystalline rocks are mica in workable sheets, feldspar suitable for porcelain manufacture, and quartz. Garnets for grinding, soapstone, talc, graphite in scales, sulphide of iron, manganese ores, nickel ore, gold, argentiferous galena, beryl, and bauxite, containing from 55 to 70 per cent. of alumina, are found in various localities. Of the precious stones found in G. the most important are amethysts, a few diamonds, moonstones, rubies, and sapphires, the first-named being found in Rabun county, diamonds in Hall county, moonstones in Upson county, and the rubies and sapphires in the northeastern part of the state. The iron ores are in the Paleozoic area which embraces the counties of Dade, Walker, Catoosa, Whitfield, Chatooga, Floyd, and the greater parts of Murray, Gordon, Bartow and Polk. Brown iron ores are mined in Bartow, Polk, and Floyd counties; the red iron ores in Walker and

Chatooga counties. Gold is found in four belts: (1) Through Rabun, Habersham, White, Lumpkin, Dawson, Forsyth, Cherokee, Cobb, Bartow, Paulding, and Harolson counties; (2) through Rabun, Habersham, Hall, Gwinnett, Forsyth, Milton, DeKalb, and Fulton counties; (3) through Cobb, Paulding, and Carroll counties; (4) through Lincoln, Columbia, McDuffie, and Warren counties; while there are some irregular deposits in Towns, Union, Gilmer, Fannin, and Meriwether counties. Ochre is found in Bartow county, and manganese in Bartow and Floyd. Pyrite deposits are found in Lumpkin county; graphite near Emerson; copper in Murray and Fannin; asbestos in the crystalline area which includes that portion of the state not in the Paleozoic area that runs north of a line extending through Columbus, Macon, Milledgeville, and Augusta. Bauxite is found in larger deposits in Floyd and Bartow counties, and in smaller quantities in Polk, Walker, and Chatooga counties; corundum is found in Rabun, Towns, Union, Habersham, Carroll, and Heard counties; the Laurel Creek mine in Rabun county being the largest in the state and one of the most noted in the U. S. Talc is found in Murray, Fannin, and Cherokee counties; barite in Bartow; mica in Union and Fannin. Dade and Walker counties contain the most important coal fields of the state. The total value of the annual mineral products of G. is over $5,000,000; the three principal mineral products, marble, granite, and coal being valued at about $900,000, $800,000, and $450,000, respectively.

Climate.— In the upper part of the state the mean temperature averages 40° in Jan. and 76° in July; in the middle, 47° in Jan. and 80° in July; and in the lower, 50° in Jan. and 80° in July; and the rainfall averages 60.3 in. in the n. e. part, 49.7 in the middle, and 41.4 in the e. In each section the seasons are regular. Spring, summer, and autumn are delightful seasons in the entire n. half of the state. The months selected by the U. S. Weather Bureau for determining temperatures, Jan. and July, are not representative months for this section. Dec. and Feb. are as a rule much milder than Jan., hence the real winter temperature is several degrees warmer than that officially reported. The general range for the state may be put reasonably at 50° in the winter to 80° in summer. The climate generally is healthful, and the state is free from epidemics. Vast tracts of pine forests render even the lower section salubrious, and have made many localities in the state famous as winter resorts and as sanitariums.

Agriculture.—There are over 250,000 farms in the State, with an aggregate value of more than $200,000,000, besides the implements and machinery which are worth over $10,000,000. The various geological formations have given the State a soil showing much variety. The greatest variety is shown in the northwest, where

rich bottom lands border the streams, rendering the conditions most favorable for the growing of corn, hay, and such fruits as apples, plums, cherries, grapes, and strawberries. Grains and grasses, with cotton, pears, apples, peaches, grapes, and various berries thrive in the north and middle sections generally. In the south pine, oak, and hickory, with the common and long-staple cottons, rice, fruits, melons, and vegetable are the chief local products. The standing timber of the State ranks among its most valuable properties. Yellow pine supplies some of the largest industries, at the same time furnishing the bulk of the freight taken both by rail and water from the State. Products of the pine, such as spirits of turpentine and rosin, form the basis of the principal commerce of the State naval stores. The total value of the cotton crop reaches almost $80,000,000 per annum, but the substitution of more valuable crops has been responsible for a falling off in the quantity and value of the rice crop.

Manufactures.—G. has made a remarkable advance in its manufacturing industries, expanding from a little over 4,000 manufacturing establishments in 1890 to about 10,000. Cotton goods have at all times formed the chief manufacture, and there are many establishments engaged in this work, the cotton mill, in the new era of development, being located practically in the cotton field. Augusta and Columbus, each within the cotton belt and enjoying abundant water power are the centres of this important industry. The manufacture of cotton-seed oil is also an important industry, there being about 50 establishments in the State devoted to this work, while G. has a larger output of turpentine than any other State in the country. The manufacture of fertilizers from phosphate rocks shows a large development, being now worth about $4,000,000 a year, while the output of malt liquor has also increased largely within recent years. The annual lumber output is worth about $14,000,000, while planing mill products, including sash, doors, and blinds, is also very valuable. The annual collection of internal revenue on special articles of manufacture amounts to approximately $700,000.

Commerce.—G. has a large foreign trade, chiefly in naval stores, and a domestic trade in cotton, pine, lumber, fertilizer and watermelons. Savannah is the chief port of entry, with imports valued at about $2,000,000 a year, and exports worth about $65,000,000.

Transportation.—The State has excellent means of internal and external communication. The coast region has steamship lines from Savannah, Brunswick, Darien, and St. Mary's, with numerous lines of small boats on the rivers and sounds. Steamboats furnish transportation on the Savannah, Altamaha, Ocmulgee, Flint, and Chattahoochee rivers. Lines of railway connect every part of the State directly with the great cities of the north and west. The principal railway lines are the

Central of G., Southern, Seaboard Air Line, Atlantic Coast Line, and G. Railroad. The total track of these lines, together with that of the smaller roads, aggregates about 7,000 miles. There are also numerous street railways, both in the cities and suburbs, having altogether approximately 500 miles of track.

Finance and Banking.—The total assessed valuation of the State in 1910 was $604,338,208, the bonded debt $6,844,000, and the tax rate $5 per $1,000. There are about 50 national banks, together with about 400 state and private banks.

Religion.—The entire State constitutes the Protestant Episcopal diocese of G., and the Roman Catholic diocese of Savannah. Altogether there are approximately 8,500 churches in the State, the strongest denominations being the Baptist and Methodist.

Education.—There are about 509,000 public school pupils, with 11,000 teachers, the public school system having developed remarkably in the State. The State board of education consists of the governor, the attorney-general, the secretary of state, the comptroller-general, and the State school commissioner, and more than $2,500,000 is annually appropriated for school purposes. There are both public and private normal schools, and many institutions of higher education, the most important of which is the University of G. The advanced institutions for the colored are Clark, Atlanta, Spellman, and Gammon universities, all at Atlanta; Payne Institute, at Augusta; and the University for the Colored, at Savannah. A State institution for the blind is also maintained at Macon and one for the deaf and dumb at Cave Spring.

The remarkable development of the public school system of G. shows a progress equaled by but few states.

History.—G. was named in honor of King George II., who granted the territory to a corporation for settlement, 1732, June 9. Previous to this time it was a dense wilderness thronged with wild beasts and venomous reptiles, and formed a portion of the original Carolina grant. Within a few months after the king signed a patent, a party of colonists was organized under James Oglethorpe (q.v.) 116 in number, who sailed from Gravesend, England, and landing on the site of Charleston, 1733, Jan., made immediate preparations to take possession of the grant. Oglethorpe was accompanied by George Whitefield and John and Charles Wesley, pioneers of Methodism. Oglethorpe, a soldier, experienced in civil and political affairs, designed to found a colony that would constitute a barrier between the Spaniards and the Indians on the s., and N. C. and S. C. on the n., while Whitefield and the Wesleys deemed the occasion auspicious to establish a refuge for the destitute and oppressed of England and a home for

orphaned and friendless children. In consonance with his intentions as well as with the protective necessities of his people, Oglethorpe explored the country in the interior and along the coast in search of an eligible location for defensive works. He found the Yamacraw tribe of Indians in possession of a suitable spot, purchased a tract of land from them, and on a high bluff overlooking the river and near the sea-coast laid the foundation of the present city of Savannah in the spring following his arrival. After a considerable portion of the immediate vicinity had been surveyed, Oglethorpe deeded tracts of land to the colonists on condition that they should pay for them with personal military service. This restriction on the tenure of land was antagonistic to the plans of Whitefield and the Wesleys, and repulsive to the colonists; and many of the latter learning that lands in N. C. were held in fee-simple removed thither. Oglethorpe then changed his policy, offered 50 acres of land free to every settler, and soon had numerous Scotch and German families taking up his lands.

When the settlement was beginning to show progress in numbers and industry, war broke out between Spain and England 1739. Oglethorpe was appointed military commander of S. C. and G., mustered 1,000 men and a number of friendly Indians, and marched against the Spaniards, in Fla. He failed in an attempt to capture St. Augustine, returned to G., began fortifying exposed points, and awaited attack by the Spaniards. At length the Spaniards appeared 1742, with a fleet of 36 vessels and a land force of 5,000 men, either sufficient to destroy Oglethorpe's entire force and occupy G. at least. The fleet sailed into the Altamaha river, captured Fort St. Simon and were preparing to bombard its companion Fort Frederica on St. Simon's Island, as a preliminary to a combined attack on Savannah, when Oglethorpe in sheer desperation made such a show of activity in various quarters that the Spaniards imagined he had an overpowering force at his command, became frightened, hastily withdrew to their ships and returned to Fla. After the restoration of peace between the belligerents, the settlers renewed their demands for slaves to till their grounds, and when slavery was prohibited a second time, general discontent set in, and many settlements were abandoned. Till this time the affairs of the colony had been vested in the corporation described as the 'trustees for settling the colony of Georgia.' When the trustees found the colony being rapidly thinned out because of their prohibition of slavery, they determined to surrender their charter to the crown and impose the responsibility for slavery, should it be deemed essential to the proper development of the colony, upon the highest authorities. G. thus became directly subordinate to the royal govt. 1752, and received privileges and regulations similar to those of the other colonies, including the right to hold slaves. From this time the colony made rapid

progress. A general assembly was established 1755; the limits of the colony—the Savannah on the n., the Altamaha on the s., and an indefinite extension in the w.—were enlarged by the annexation by royal proclamation of all the territory between the Altamaha and St. Mary's rivers 1763; and a greatly enlarged area was brought under profitable cultivation. In 1775 the commerce of the colony amounted to $1,086,270.

It was acknowledged at the time and the claim has since been substantiated beyond question, that the people of G. had no cause for personal or colonial dissatisfaction with England during the exciting days that preceded the revolution. The relations between the colony and the home govt. had been wholly amicable and none of the acts of oppression of which the New England colonies particularly complained had been enforced against the colony of G. But when the movement of protestation began to take effective shape in the n. and e., G. patriotically volunteered her sympathy and co-operation, and soon began to render very practical aid to the patriots in the New England states. On 1775, May 11, Col. Joseph Habersham and Commodore Bowen with about 30 volunteers seized the British powder magazine at Savannah which contained 13,000 pounds of powder and the Georgia authorities sent 5,000 pounds of it to the Continental army at Boston, retaining the remainder for future exigencies. In 1776, March, Col. McIntosh with a party of Georgians and Col. Bull with a small company of Carolinians succeeded in burning 3 and disabling 6 of the 11 merchant vessels which were endeavoring to carry on trade with some of the loyalist planters under protection of some British war vessels. A convention was called 1775, July, which assumed a share in the grievances of the other colonies and appointed delegates to the congress instructed to pledge the support of G. to its public measures. Immediately after this action Sir James Wright, the royal gov., resigned and returned to England. The population that year was estimated at 70,000. From the time that her delegates (Button Gwinnett, Lyman Hall, and George Walton) signed the Declaration of Independence till the close of the revolutionary war, G. suffered severely by British land and naval forces. Savannah was captured 1778, Augusta and Sudbury 1779, but a combined force of Carolinians under Andrew Pickens and Georgians under John Dooly and Elijah Clarke subsequently recovered Augusta by the victory of Kettle Creek. Subsequently the British defeated Ashe at Brier Creek. A combined American and French force under Gen. Lincoln and Count D'Estaing (q.v.) in one of the most desperate and important battles of the revolution, made an attempt to recapture Savannah and lost nearly 1,000 men in the assault 1778, Sep., and the city remained in possession of the British till peace was concluded, when on 1782, July 11, they evacuated it. Gen. Lincoln was

compelled to surrender Charleston 1780, the British overran all the eastern part of G. and the patriots in S. C. and G. could do little more than carry on an irregular warfare till Gen. Greene marched down from the n. with a large army and drove the royal troops from the provinces. Meanwhile Elijah Clarke, having failed in his first attempt to recapture Augusta, tried again in 1781 and by the assistance of Pickens and 'Light Horse' Harry Lee, succeeded. One of the last battles of the war was between Wayne and the Indian allies of the British near Savannah 1782, June 23, in which the American forces were victorious. After the peace, G. was the third state to ratify the federal constitution at a convention at Augusta, 1788, Jan. 2. She framed her first constitution 1777, second 1785, third 1798, fourth 1868, and fifth 1877.

Between 1783 and 1790 Creek and Cherokee Indians created much alarm in the state by their depredations along the frontier, but treaties were made with them 1790 and 1791. In 1802 a special treaty with the Creeks gave to the United States a large tract of land which now comprises the s.w. counties of the state and the federal govt. exchanged the tract for the possessions of G. w. of the Chattahoochee, from which the states of Ala. and Miss. were subsequently formed. The isolated settlements were subject to Indian raids, incited by the Spaniards in La., till the govt. obtained possession of that territory; the state became involved in hostilities with the Indians during the second war with England 1812--15 and the Georgians under Gen. John Floyd gained several victories over them and shared with the Tennesseeans in their victories won over the savages by Gen. Andrew Jackson. It was not till the cession of Fla. to the U. S. that G. was finally relieved of troubles of Spanish origin. In 1825, the govt. of G. took the military steps toward extinguishing the title to lands in the state held by the Creeks and Cherokees. This led to serious complications with the federal govt., the head chief of the Creeks was killed by his own people for having signed away their lands, and a war of extermination was threatened for several years. In 1830 congress passed an act providing for removal of the Indians to the territory w. of the Miss. river, and in 1838 the transfer was accomplished after much friction between the state and federal authorities.

In 1860, Nov., the legislature provided for a convention to determine the question of the state's attitude in the impending national crisis. The convention met at Milledgeville 1861, Jan. 16, and on the 19th decided to secede from the Union by a vote of 208 to 89. G. ratified the Confederate constitution Mar. 16, assumed jurisdiction over forts, arsenals, and other places that it had ceded to the United States, and seized and transferred to the Confederacy Forts Pulaski and Jackson at Savannah, and the U. S. arsenal at Augusta with all its

munitions of war. 1861, Nov., Com. Du Pont, U. S. N., captured Port Royal, S. C., occupied Big Tybee island at the mouth of the Savannah, and erected works for the reduction of Fort Pulaski. 1862, Mar., he took possession of St. Mary's, Brunswick, Darien, and St. Simon's islands, and Apr. 11, received the surrender of Fort Pulaski after a vigorous bombardment from the fleet and island batteries. In the early part of 1863, aggressive operations were confined to the sea-coast, Com. Worden destroyed the Confederate ironclad *Nashville* in Ogeechee river Feb. 28; made an unsuccessful attack on Fort McAllister on the same river s.w. of Savannah, March 3; and aided in burning Darien June 11; and Capt. Rodgers captured the Confederate ironclad *Atlanta* in Warsaw Sound June 17. The military operations before Chickamauga, Tenn., 1863, Sep. (see CHICKAMAUGA, BATTLES OF) constituted the opening of a most remarkable series of maneuvers, and transferred the chief theatre of war after that of the Potomac to the borders of G.; and from that date till 1865, May, G. was almost constantly the scene of conflict. In 1864, May, Gen. Sherman started on his great campaign from Chattanooga, Tenn. (see CHATTANOOGA, BATTLES OF), which resulted in the occupation and partial destruction of Atlanta Sept. 1. On Nov. 15 he set out on his great march to the sea, Nov. 23 entered Milledgeville, Dec. 10 reached the vicinity of Savannah, Dec. 13 took Fort McAllister by storm, and Dec. 21 occupied Savannah. Gen. Wilson took Columbus, West Point, and Macon, Apr., and captured Jefferson Davis, the Confederate pres., who had fled from Richmond, at Irwinville, May 10.

After the surrender of Johnston's army G. was under military control till June 17, when James Johnson was appointed by Pres. Johnson provisional governor. A convention at Milledgeville repealed the ordinance of secession 1865, Oct. 30, declared the war debt void, abolished slavery, and ordered an election for state officers and members of congress. The legislature ratified the amendment to the federal constitution abolishing slavery; state officers and U. S. senators and representatives were elected, and the provisional gov. was directed to surrender to the new gov. the govt. of the state. Subsequently congress disapproved of these measures, and G., Ala., and Fla. were constituted a military division, and placed under command of Gen. Pope. A constitutional convention was held 1868, Mar., and the govt. of the state was restored to the civil authorities July 30. A refusal to ratify the XVth amendment to the federal constitution led to the state being again placed under military rule, but upon its acquiescence it was once more turned over to its own officers, and its reconstruction was finally accomplished 1868, December.

The development of G. since the close of the war has been remarkably rapid and substantial. A liberal public policy, ably supplemented by individual effort, has

changed the industrial characteristics of the state, and given it high rank as a manufacturing commonwealth, and made it a striking example of the results of well-directed energy. The first notable outgrowth of the new policy was the International Cotton Exposition held in Atlanta 1881, Oct. 5–Dec. 31, which was a great success, but was far surpassed in every way by the Cotton States and International Exposition 1895, Sep. 18–Dec. 31. The site was Piedmont Park, containing 189 acres, about 2 m. from Atlanta. A notable and suggestive feature was the U. S. govt. building. There were 12 other principal structures. The buildings and the preparation of the grounds cost over $2,000,000. During the Spanish-American war G. furnished a larger number of troops to her population than any other state.

Government.— For administrative purposes G. is divided into 137 counties. The executive authority is vested by the constitution in a gov. elected for two years, salary $5,000 per annum; the legislative in a general assembly comprising a senate of 44 members, elected for two years, and a house of representatives of 181 members also elected for two years, salary $4 per diem and mileage; and the judicial in a supreme court of one chief justice and five associate justices, and 24 superior court circuits each having a judge and solicitor. The legislature meets biennially in the even-numbered years. Judges of the supreme court are appointed for terms of 12 years; salaries chief justice and two associate justices $2,500 each per annum. The three principal circuit judges received $3,500 each per annum. The state officers include sec. of state; treas.; comp.gen.; atty.gen.; school commissioner; commissioner of agriculture; adj.gen.; 3 railway commissioners; geologist; librarian; and 3 prison commissioners. The state is represented in congress by 2 senators and 11 representatives.

The successive govs., with their terms of office since the adoption of the U. S. constitution, are as follows:

George Walton ...1789-90	Geo. W. Crawford..1843-7
Edward Telfair 1790-3	Geo. W. B. Towns.1847-51
George Matthews ..1793-6	Howell Cobb.....1851-3
Jared Irwin 1796-8	Herschel V. Johnson.1853-7
James Jackson...1798-1801	Joseph E. Brown..1857-65
David Emanuel(act'g)1801	Jas. Johnson (provis'l)1865
Josiah Tatnall 1801-2	Charles J. Jenkins..1865-7
John Milledge 1802-6	Gen. T. H. Ruger (provis'l)
Jared Irwin 1806-9	1867-8
David B. Mitchell..1809-13	Rufus B. Bullock..1868-72
Peter Early 1813-15	James M. Smith....1872-7
David B. Mitchell..1815-17	Alfred H. Colquitt.1877-82
William Rabun ...1817-19	Alex'r H. Stephens.1882-3
Matthew Talbot(act'g)1819	J. S. Boynton (act'g)..1883
John Clarke 1819-23	Henry D. McDaniel.1883-6
George M. Troup...1823-7	John B. Gordon....1886-90
John Forsyth 1827-9	W. J. Northen.....1890-94
George R. Gilmer.1829-31	Wm. Y. Atkinson..1894-98
Wilson Lumpkin...1831-5	Allen D. Candler.1898-1902
William Schley.....1835-7	J. M. Terrell....1902-1906
George R. Gilmer..1837-9	Hoke Smith.....1906-1908
Chas. J. McDonald.1839-43	Joseph M. Brown..1908—

GEORGIA.

State elections are held on the first Wed. in Oct.; congressional and presidential, Tues. after the first Mon. in Nov. For vote for president see PRESIDENT AND VICE-PRESIDENT, ELECTION OF.

Population.—The population and relative rank of the state are given below.

Year.	Rank.	White.	Free colored.	Slave.	Total.
1790	13	52,886	398	29,264	82,548
1800	12	101,678	1,010	59,404	162,101
1810	11	145,414	1,801	105,218	258,433
1820	11	189,564	1,767	149,654	340,987
1830	10	296,806	2,484	217,533	516,823
1840	9	407,695	2,753	280,944	691,392
1850	9	521,572	2,931	381,682	906,185
1860	11	591,550	3,538	462,198	1,057,286
1870	12	638,926	545,183	.....	1,184,109
1880	13	816,906	725,274	.....	1,542,180
1890	12	978,538	858,815	.....	1,837,353
1900	11	1,181,518	1,034,813	.....	2,216,331
1910	10	.....	.....	.....	2,609,121

GEOR'GIA, *jaʊr jī-a:* name formerly applied to the central portion of what is now Russian Transcaucasia (q.v.), bounded by the Caucasian Mountains on the n., and by the Armenian Mountains on the s. The Persian name is Gurjestan, from which the name G. is probably derived; the Russian, Grusia; and the native, Iberia.

The early history of the Georgians is wrapped in fable. Alexander the Great conquered G., but after his death the country regained its independence under Pharnawas, with whom began the series of Mephé or kings of G., who, under a variety of dynasties, ruled the country almost without interruption more than 2,000 years. Toward the end of the 4th c. Christianity was introduced by St. Nina. During the reign of the Sassanian dynasty (265–787) the country was conquered by the Arabs and held, though in constant rebellion, for nearly 100 years. The most noted king of the Bagratides, Babret III. (980–1008), extended the kingdom from Caspian to the Black Sea. In 1048 began a long series of contests with the Seljukes (q.v.), throughout which, however, G. maintained its independence. The reign of Tamar 1184–1212 was the era of the greatest extent and prosperity of the nation. Alexander I. (1413–1442) committed the fatal error of dividing the kingdom among his three sons, and from that time forward internal strife was added to the horrors of repeated Mongol devastations. At last in 1799 George XIII. resigned the crown to Alexander I. of Russia, and the history of G. merges into that of Russia.

The Georgians belong to the Kartveli stock, forming the s. group of Caucasian peoples. With the Imerians, Mingrelians, and Laz, they are accordingly of the Caucasic or Fair race (as opposed to the Mongolic or Yellow race). They are noted for their beauty, and under the

Mohammedan rule, the white slaves of w. Asia and of Egypt were drawn mostly from among them and the Circassians. Their numbers are estimated at about 1,100,000.

The language of the Georgians is harsh, but regular and forcible. It has a peculiar structure, but is clearly of the Agglutinative type. With the languages of one or two allied tribes, it constitutes a group to which the name *Iberian* has been given. The Georgian literature begins with the introduction of Christianity, and consists chiefly of ecclesiastical writings, translations of the Bible, the fathers, Plato, Aristotle, and their commentators. A few heroic poems may be traced back to the time of Queen Tamar. The golden era of Georgian literature was the 17th and 18th centuries. It was unfavorable to the mental culture of the country, that, 1807, the archives and scientific works of G. were conveyed to St. Petersburg, and a thorough Russianizing is now in progress in all government schools.

GEORGIA, Gulf of: arm of the North Pacific Ocean, between Vancouver's Island and the mainland of British Columbia. It averages 20 m. in width, is 100 m. long, receives Fraser River (q.v.), and communicates with the open ocean by Queen Charlotte's Sound in the n. and by the Strait of Fuca in the south.

GEORGIA, University of: at Athens; chartered 1785; organized 1801; placed under its present form of govt. 1889. It is unsectarian, and tuition is free in all its schools excepting those of law and medicine. The constituents are Franklin College (a school of liberal arts); the State College of Agriculture and the Mechanic Arts, with its branches; Graduate School; Law School; Medical School; School of Technology; State Normal and Industrial College for young women; and State Normal School. The univ. grounds proper in Athens cover an area of 37 acres, and contain the new college building, chapel, library, Moore College, gymnasium, Ivy building, Y. M. C. A. building, dormitory, halls of the Demosthenian and Phi Kappa literary societies, the chancellor's residence, houses occupied by several of the professors, parade ground, and athletic field. There are biological, chemical, physical, and physiological laboratories, and a natural history museum. Two miles from the chapel is the univ. farm of 65 acres, with a substantial building, Rock College. Instruction in military tactics is given by an officer detailed from the United States army. The library contains nearly 40,000 vols. The university is attended annually by nearly 3,000 students.

GEORGIAN BAY, *jawr'jĭ-an:* e. portion of Lake Huron, in province of Ontario, Canada, 120 m. long and 50 m. wide, shut in from the main body of the lake by the peninsula of Cabot's Head on the s., and the Manitoulin chain of islands on the n. Formerly the bay was known as Lake Manitoulin.

GEORGICS, n. *jawr′jĭks* [L. *Georgĭcă*, the Georgics—from Gr. *gē*, the earth; *ergon*, labor]: a poem of Virgil, the anc. Latin poet, treating of the rules for cultivating land, a poem on rural subjects. GEOR′GIC, a. *-jĭk*, relating to agriculture.

GEORGIUM-SIDUS, n. *jawr′jĭ′ŭm-sī′dŭs* [L. for *George*, used as an adjective, and L. *sīdus*, a star]: the name of a planet, better known as Uranus or Herschel. Sir William Herschel, its discoverer, proposed to name it Georgium-Sidus in honor of George III., in whose reign it was discovered, 1781.

GEORGSWALDE, *gā′ŏrgs-vâl-dė:* small town on the n. border of Bohemia, 64 m. n. of Prague. It has a mineral spring and manufactures of linen.

GEORHYCHUS, n. *jē-o-rī′kŭs* [Gr. *gē*, the earth; *orussō*, I dig]: typical genus of *Georhychidæ* (mole-rats), a family of rodentia, found in Asia, Africa, and s. e. Europe, burrowing like moles.

GEORYSSUS, or GEORISSUS, *jē-o-rĭs′sŭs:* typical genus of the *Georyssidæ*, family of beetles, tribe *Clavicornes* (q.v.).

GEOSAURUS, n. *jē′ō-saw′rŭs* [Gr. *gē*, the earth: *sauros*, a lizard]: in *geol.*, a gigantic terrestrial reptile of the oolitic epoch.

GEOSCOPY, n. *jē-ŏs′kō-pĭ* [Gr. *gē*, the earth: *skŏpĕō*, I view]: a knowledge of the different kinds of earth.

GEOSELENIC, a. *jē-o-sē-lĕn′ĭk* [Gr. *geō* for *gēios*, belonging to the earth; *selēnē*, the moon]: pertaining or relating to the earth and the moon, with reference to their relations.

GEOSTATIC, a. *jē-o-stăt′ĭk* [Gr. *gē*, the earth; Eng. *static*]: term applied to a peculiar kind of arch, suited to sustain the pressure of earth.

GEOTEUTHIS, *jē-o-tū′thĭs:* genus of fossil calamarics, peculiar to the Oolitic period. The shell or horny pen is broad and truncated in front, and pointed behind, with the lateral wings shorter than the shaft. Some specimens from the Oxford clay are remarkably preserved, still showing the muscular mouth, the bases of the arms, and the ink-bag. The ink has been made into Sepia. Some of the ink-bags from the Lias are nearly 12 inches long, and are invested with a brilliant nacreous layer. More than a dozen species have been found.

GEOTHERMIC, a. *jē-o-thėr′mĭk* [Gr. *gē*, the earth; Eng. *thermic*]: of or relating to the internal temperature of the earth.

GEO-THERMOMETER, n. *jē′ō-thėr-mŏm′ĕ-tėr* [Gr. *gē*, the earth, and *thermometer*]: an instrument for measuring the earth's heat at different depths, as in wells and mines, and for ascertaining its rate of increase.

GEOTROPISM, *jē-ŏt′rō-pĭzm*, [Gr. *gē*, the earth, *tropē*, a turning]: the influence which causes a tendency in plants and animals to grow toward the centre of the earth; it is defined by Dr. John Coulter as 'sensitiveness to

gravity.' Geotropism in its simplest form, called 'positive,' causes growth directly downward, as in the tips of roots, which strike straight down into the earth. So strong is this influence upon roots that they will turn from any abnormal position in which they are placed and bend downward until they reach and penetrate the ground,—an adaptation for the preservation of plants against dislodgment by wind or water. The reverse of this is negative geotropism (apogeotropism), the influence which causes parts of plants, particularly stems, to grow *away from* the earth. A demonstration of these opposing influences in regulating plant-growth is found in the fact that when seedlings are caused to revolve continuously and rapidly for a period, their stems point and increase toward the centre of the centrifugal force, while the roots take the opposite line of growth. A third form of the tendency is called 'diageotropism.' and leads parts subject to its influence, as runners and rhizomes, to grow horizontally; that is, in a direction at right angles to the plane of positive geotropism. This influence is seen in the tendency of branches and foliage to assume a horizontal position. In all these cases, however, the result is modified and complicated by influences of sunlight, moisture, etc., styled heliotropism, hydrotropism, chemotropism, etc.; and sometimes, as in the case of twining plants, it is impossible at present to extricate them and assign to each its part in the result.

GEPIDÆ, *gĕp'ĭ-dē:* ancient race of Germanic people, somewhat similar to the Goths, who lived near Vistula, on the Baltic, when first discovered in the 3d c. Afterwards they settled between the Ostrogoths on the e. and the Visigoths on the w., became subjects of Attila, regained independence under their own king on Attila's death, drove out the Huns and occupied their territory; were defeated by Theodoric, King of the Ostrogoths, 488; and were finally subjugated by Albion, King of the Lombards, 566.

GERA, *gā'râ:* town of Germany, chief place in the small principality of Reuss-Schleiz; pleasantly situated on the right bank of the White Elster, 35 m. s.s.w. of Leipsic. It is handsomely built, with broad and regular streets, and has six squares, a castle, a fine town hall, and several religious and educational institutions. There are extensive manufactures of woolen and cotton goods, also machine-making, and manufactures of soap, gloves, leather, hats, tobacco, waxcloth, ironware, stoneware, and porcelain. Ten manufactories of harmonicas employ 1,500 hands. Beer is extensively manufactured for export. The town is prospering. Pop. 50,000.

GERACE, *jā-râ'chā:* ancient commercial town in s. Italy, chief town of the dist. of Gerace, province of Reggio. It occupies a beautiful and fertile situation on the upper slopes of the Apennines, about four m. from the Ionian Sea. On the destruction of the anc. town of Locri by the Saracens in the 12th c., the inhabitants, out of the ruins of

their homes, constructed a new settlement about four m. from the site of Locri, on the sea-shore, and called it Santa Ciriace, which has since become *Gerace.* This town has suffered from repeated earthquakes, in one of which, 1783, both the cathedral and the citadel, a fortress of great strength, were reduced to ruins. In a neighboring plain are ruins supposed to occupy the site of Locri Epizephyrii, important city of Magna Grecia, celebrated by Pindar in more than one of his odes. Coins bearing the epigraph of Locri have been found in the vicinity of the ruins, and together with the Greek character of the ruined edifices, seem to support this supposition. The modern G. is well-built, and owes its commercial prosperity to its silk factories and its trade in wine, a sweet white kind of which, known as 'Il Greco di Gerace,' has deservedly high repute. Pop. about 5,000.

GERAH, n. *gē'ră:* a Hebrew coin, equal to nearly three cents.

GERALD DE BARRI: see GIRALDUS CAMBRENSIS.

GERANDO, DE: see DEGERANDO, MARIE JOSEPH.

GERANIUM, n. *jĕ-rā'nĭ-ŭm* [L. *gerănĭŭm;* Gr. *gerănĭŏn*—from Gr. *gerănŏs,* a crane]: extensive genus of exogenous plants, type of the nat. ord. *Geraniaceæ,* the limits

a, Geranium; *b,* Pelargonium;
c, Herb Robert (*Geranium Robertianum*).

of which correspond with those of the Linnæan genus. Of this order is the large genus *Pelargonium* (q.v.), native of the region of the Cape of Good Hope—a genus distinguished by an irregular corolla and by a nectariferous tube running down the flower-stalk. Many species of *Pelargonium,* and many fine hybrids and varieties produced by cultivation, are seen in green-houses, and some are frequent in cottage-windows; the name geranium is still frequently given them. In some countries, as Britain, species of *Geraniaceæ* are common weeds in fields and gardens,

with small flowers; others have large and beautiful flowers, and are among the finest ornaments of groves and meadows. Some species of *Geranium* are much cultivated in flower-gardens. The name *Geranium* [Gr. *geranos*, a crane], the popular English name *Crane's-bill*, and the German *Storchsnabel*, all refer to the beaked fruit. The *Geraniaceæ* are generally characterized by astringency; many have a disagreeable, others a pleasantly aromatic and resinous smell, some a delightful fragrance. The STINKING CRANE'S-BILL or HERB ROBERT (*Geranium Robertianum*) with a diffuse habit, deeply divided leaves, and small flowers, has been used medicinally as an astringent, and in nephritic complaints. *G. maculatum*, n. American species, with flowers of considerable beauty, is the most valuable medicinal plant of the order. Its root, called in the United States ALUM ROOT, is extremely astringent, and abounds in tannin: it is used for gargles and as a medicine in various diseases. GERANIACEÆ, n. plu. *jĕ-rā'nĭ-ā'sĭ-ē*, natural order of exogenous plants, consisting of herbaceous plants and shrubs, of which about 500 species are known, distributed over the whole world, and abundant particularly in s. Africa. See GERANIUM. The stems are jointed, usually tumid, and easily broken at the joints. The leaves are simple in some, divided in others, opposite, or alternate, with flower-stalks opposite to them; they have membranous stipules. The calyx consists of five persistent sepals; the corolla of five petals, which are clawed. The stamens are united by their filaments, hypogynous, twice or thrice as many as the petals. The ovary consists of five carpels around a long awl-shaped *torus* or *carpophore*, to which the styles cohere; ripening into a fruit which consists of five small one-seeded shells cohering around the base of a long beak, the indurated style of each carpel finally curling back from the base upward, and carrying the seed with it. The indurated styles are in many species extremely hygroscopic, and their twistings and untwistings seem intended to move the seed after it has fallen, until it reach a fit place for its germination.—A few *Geraniaceæ* produce edible tubers: those of *Geranium tuberosum* are eaten in s. Europe; those of *G. parviflorum* in Van Diemen's Land, where they are known as *Native Carrot;* and those of *Pelargonium triste* at the Cape of Good Hope. The leaves of *Pelargonium acetosum* and *P. peltatum* are edible, and gratefully acid. The cultivated *Geraniaceæ* are propagated by seed or by cuttings; the shrubby kinds are very easily propagated by cuttings. They require a light rich soil: a mixture of leaf-mould and sand is very suitable. They are kept low by pruning, to increase their beauty and their productiveness of flowers. GERA'NIAL, a. *-nĭ-ăl*, pertaining to. GERANIN, n. *gĕr'ă-nĭn*, a valuable astringent obtained from the root of one of the graniums called *crane's-bill.*

GÉRARD, *zhā-râr'*, ETIENNE-MAURICE, Comte, Marshal of France: 1773, Apr. 4—1855, Apr. 17; b. Damvilliers, in Lorraine. He enrolled as a volunteer in the second battalion of the Meuse, and served during the campaign of

1792–3 under Dumouriez and Jourdan, and afterward accompanied Bernadotte on his embassy to Vienna, where he was the means of saving his master's life in the mêlée that ensued on his arrival. After rapid promotion, he was appointed col. 1800, Nov. 15; and 1805 aide-de-camp to his friend Bernadotte. He specially distinguished himself at Austerlitz (1805), for which he was appointed gen. of brigade; also Halle (1806), Jena (1806), Erfurt (1806), Lintz (1809), and Wagram (1809). On the morning after this last battle, he received the title Baron of the Empire. He was in the wars of the Spanish Peninsula and in the Russian campaign; and 1812 was made gen. of division. Subsequently, Napoleon named him Count of the Empire. After the first restoration, he was named Grand Cross of the Legion of Honor, and Chevalier of St. Louis, and received various honorable appointments. On the return of Napoleon from Elba, G. joined him, and commanded the fourth corps, numbering 16,000 men. At the battle of Ligny G. was opposite to the centre of the Prussian position, which covered Ligny, and was thus in the hottest of the fight. On the morning of June 18, G. was near Wavres when firing was heard in the direction of Soignies, upon which a council was called, and if G.'s advice had been taken the battle of Waterloo might perhaps have had different result. After the second restoration G. was compelled to leave France, and did not return till 1817. He was elected a member of the chamber of deputies 1822; was active in the revolution of 1830, and commanded the troops appointed to maintain order and tranquillity in Paris. In 1831 Louis Philippe appointed G. a marshal of France, and gave him command of the expedition to Belgium, in which he distinguished himself by taking Antwerp 1832, Dec. In 1835 he succeeded Marshal Mortier as grand chancellor of the Legion of Honor.

GÉRARD', François Pascal, Baron: 1770, Mar. 11—1837, Jan. 11; b. Rome: one of the first historical and portrait painters of the modern French school. At an early age he went to France, and was apprenticed to Pajou, the sculptor, in Paris. He afterward worked for some time in the studio of the painter Brenet, and in his 16th year became the pupil of David, but his artistic career was interrupted for several years by the Revolution. In 1795, he exhibited his first picture, *Belisarius;* some time afterward he painted *Psyche Receiving the First Kiss from Cupid.* He then turned his attention to portrait-painting. He gained Napoleon's favor, was loaded with honors, and received, with other commissions, that of painting the Battle of Austerlitz, perhaps the most successful of his paintings illustrating the campaigns of Napoleon. But his grandest work—for size and merit—is *Entrance of Henri Quatre into Paris,* 30 ft. wide by 15 high, glowing with life, bright with color, and accurate in costume; painted 1817. Soon afterward he was appointed first court-painter, and raised to the rank of baron by Louis XVIII. He died at Paris. G.'s most celebrated portraits are—Napoleon in his Coronation Robes, the Queen of Naples and her Children, Talleyrand, Talma, Louis Philippe, and Madame

Récamier. Of his other pictures, the best known are *Ossian's Dream* (engraved by Godefroy), *Homer* (engraved by Massard), *Daphnis and Chloë, Philip V., Corinna on the Promontory of Misena, St. Theresa Kneeling at the Altar, Thetis Bearing the Armor of Achilles.*

GÉRARD, JEAN IGNACE ISIDORE: see GRANDVILLE, JEAN IGNACE ISIDORE GÉRARD.

GERARD, *jė-rârd'*, JOHN: 1545–1612, Feb.; b. Nantwich, Cheshire, England: botanist and surgeon. He was educated at Willaston, spent several years in travel, settled in London to practice surgery, and was head gardener to Lord Burghley, Queen Elizabeth's sec. of state, 1577–97. He published a catalogue of 1,039 plants cultivated in his own garden 1596, and a curious *Herball* with numerous quaint illustrations 1597. He was buried at St. Andrews, Holborn.

GERARD, *zhā-râr'*, THE BLESSED (surnamed TUM, TUNC, TENGUE, or THOM): about 1040–1120: saint of the Rom. Cath. Church, and founder of the order of Knights Hospitallers of St. John of Jerusalem, or Knights of Malta. His birthplace is variously given as Martigues in Provence, and the Chateau d'Avesnes in Hainault, and his occupation as soldier and as merchant. He went to Jerusalem toward the end of the 11th c., became guardian of the hospice there about 1100, and organized the religious order of St. John, to which Pascal II. gave the papal recognition 1113 in a bull, which Calixtus II. renewed and confirmed 1120. G. built hospitals in the chief maritime towns of w. Europe for the accommodation of pilgrims, and these subsequently became commanderies of the order.

GERARDIA, n. *jĕr-ârd'ĭ-a* [named from John *Gerard* (q.v.)]: typical genus of *Gerardieæ*, a tribe of *Scrophulariaceæ*, sub-order *Rhinanthideæ.*

GERASA, *gĕr'a-sa* or *jĕr'a-sa:* in the time of the Romans, city of Palestine, on the e. borders of Peræa; among the mountains of Gilead, about 20 m. e. of the Jordan, 25 m. n. of Rabbath-Ammon. It attained prosperity under the Antonines A.D. 138–180. On the rise of Christianity it became the seat of a bishopric, but subsequently sank into decay. G. is now notable only for its ruins, said to be the most beautiful and extensive in Palestine e. of the Jordan. It still preserves its original outlines; great portions of the surrounding wall are in good preservation; three of the gateways are almost perfect, and within the city more than 230 columns are standing on their pedestals.

GERBA, *jĕr'ba*, or GERBI, or JERBA, *jĕr'ba* (Meninx of Strabo and Pliny; Ger. *Dscherba*): island on the n. coast of Africa belonging to the state of Tunis; in the Gulf of Cabes; separated by a strait from a headland on the shore. It is about 20 m. long and 12 m. broad; contains abt. 425 sq. m.; and is fertile and populous. Shawls of brilliant colors, beautiful silk and woolen fabrics of finest texture, bournous and blankets, are manufactured. This island contains a triumphal arch in honor of Antoninus and Verus; a pyramid 25 to 30 ft. in height, built of the skulls of the Spanish

soldiers who fell here in the 16th c. in a disastrous battle with the Turks, was removed 1837. Pop. 30,000.

GERBERT: see SILVESTER II.

GERBERT, *gĕr'bert*, MARTIN: 1720, Aug. 12—1793, May 3; b. Horb, Würtemberg: Rom. Cath. abbot and writer on church music. He was educated. at Freiburg, at Klingenau, Switzerland, and at the monastery of St. Blaise in the Black Forest, joined the Benedictine order 1736, was ordained priest 1744, and, after serving nearly 20 years as prof. of theol. at St. Blaise's monastery, became abbot 1764. While holding his professorship he visited the oldest monasteries in Germany, Italy, and France, to study their collections of musical literature, and while abbot published *De cantu et musica sacra*, 2 vols, (1774); *Monumenta veteris liturgiæ Alemannicæ* (1777); *Scriptores ecclesiastici de musica sacra*, 3 vols. (1784); beside *Codex epistolaris Rudolphi* I. (1772), and *Historia Nigræ Silvæ* (1783–88).

GERBIL, *jĕr'bĭl:* rodent of the rat species; native of Asia, Africa and e. Europe, beautiful fawn in color, nocturnal and active in movement, living in deep burrows in which it stores large quantities of grain. It is very offensive in odor.

GERBOA, or GERBUA: see JERBOA.

GER'DA: in Norse mythology the wife of Freyr.

GERFALCON and GYRFALCON, n. *jĕr'faw-kn* [OF. *gerfault;* mid. L. *gerofalco*—from *gyrus*, a circle; *falco*, a falcon: Ger. *geierfalk*]: a large and fierce species of falcon of a white color—so named from its circling flight.

GERGESA: see GADARA.

GERHARD, *gĕr'hârt*, JOHANN: 1582, Oct. 17—1637, Aug. 20; b. Quedlinburg, Saxony: theologian. He was educated in the universities of Wittenberg, Marburg, and Jena, took a full medical course, studied theology 1603, graduated at the Univ. of Jena 1604, became master of Heldburg Gymnasium 1606, and soon afterward gen. (ecclesiastical) supt. of the duchy of Coburg. In the last capacity he was actively engaged in the work of ecclesiastical organization till 1616 when he accepted the tender of the senior theol. chair in the Univ. of Jena, which he held till death. In his own day he was regarded as the greatest living theologian of Protestant Germany, his advice was widely sought on important questions, and he received flattering offers for his services from nearly every univ. in Germany, as well as from that of Upsala, Sweden. His writings in exegetical, polemical, dogmatic, and practical theol. are very numerous.

GERHARDT, *gĕr'hârt*, F. *zhā-râr'*, KARL FRIEDRICH: 1816, Aug. 21—1856, Aug. 19; b. Strasburg: eminent chemist. At the age of 15 he was sent to the Polytechnic School of Carlsruhe, where his attendance at Prof. Walchner's lectures awaked in his mind a taste for chemistry. After two years residence in Carlsruhe he removed to Leipsic where he attended the lectures of Erdmann, which seem to have developed in him a passion for speculative chemistry.

In 1838 he arrived in Paris, where he was welcomed by Dumas, and gave lectures and instructions in chemistry, and, with Chevreul's permission, worked in the laboratory of the Jardin des Plantes, where, with his friend Cahours, he commenced his important researches on the essential oils. In 1844 he was appointed prof. of general chemistry in the Faculty of Sciences at Montpellier, and in the same year he married the youngest daughter of Dr. James Sanders of Edinburgh. About this time he published his *Précis de Chimie Organique*, in which he sketches the idea of 'Homologous and Heterologous Series' (q.v.), which at a later period he so successfully developed In 1845, with Laurent, he commenced the *Comptes rendus des Travaux de Chimie publiés en France et à l'Etranger*, which were continued till 1848. In 1848, he resigned his chair and returned to Paris, to follow his special investigations; and in that city he established in successive memoirs (1849–55) his views of series (above adverted to) and the theory of types, with which his name will be ever associated in the history of chemistry. It was there, also, that he gave to the scientific world his remarkable researches upon the anhydrous acids and the oxides. All his ideas and discoveries are embodied in his *Traité de Chimie Organique* (1853–56, 4 vols.), which forms, to use the words of his friend and biographer Cahours, 'an important monument of modern science.' He had hardly completed the correction of the last proof of this great work, when, after an illness of only two days, he was surprised by death. He had just received the diploma of corresponding member of the Acad. of Sciences at Paris, and had been appointed prof. of chemistry at Strasburg. See GERHARDT'S NOTATION.

GER'HARDT, PAUL: 1607, Mar. 12—1676, June 7; b. Gräfenhainchen, near Wittenberg; theologian and hymnologist. Little is known of his early life excepting that he studied for the ministry, became tutor in an advocate's family in Berlin, and received his first appointment at Mittelwald, 1651. In 1657 he became deacon in the church of St. Nicholas in Berlin, warmly espoused Lutheranism, and for this, as well as for his refusal to accept the syncretistic edict of 1664—which forbade either party to revile the other in the pulpit or charge it with heresy—he was deprived of his office, 1666. On the petition of citizens he was restored to the diaconate 1667, Jan., but his conscience forced him to resign it within a month, and after living a year in Berlin unemployed he was appointed archdeacon of Lübben, in Saxe-Merseburg, where he preached till his death. Next to Luther he ranks as the best German hymn writer, and many of his compositions are now sung throughout the world in the form of John Wesley's translations.

GERHARDT'S NOTATION, in Chemical Science. On certain theoretical grounds, Karl Friedrich Gerhardt (q.v.) doubled the numbers that had been current expressing the atomic weights of certain of the chemical elements —oxygen, carbon, sulphur, selenium, and tellurium; the other numbers remaining unaltered. The following table shows the earlier system and Gerhardt's numbers:

	Old Equivalent.	Gerhardt's Equivalent.
O,	8	16
C,	6	12
S,	16	32
Se,	39.75	79.5
Te,	64.5	129

The examination of a few formulæ will enable the student to translate from one system into the other:

Compounds.	Old Formulæ.	Gerhardt's Formulæ.
Water,	HO	H_2O
Potash,	KO	K_2O
Hydrate of Potash,	KO,HO	KHO
Hydrated Nitric Acid,	HO,NO_5	NO_3H
Hydrated Sulphuric Acid,	HO,SO_3	SO_4H_2
Hydrated Acetic Acid,	$HO,C_4H_3O_3$	$C_2H_4O_2$
Alcohol,	HO,C_4H_5O	C_2H_6O

In Gerhardt's formulæ the symbols whose equivalents are changed are printed above in italics. Each system of notation seemed to have its advantages; and at first British chemists generally adhered to the old: the new system is now generally adopted. The general principle on which it is grounded is, 'that the atomic weights of an element and of its combinations should be selected so as to express the entire series of combinations by the simplest series of formulæ; so as best to accord with the chemical properties and metamorphoses of the bodies; so as best to illustrate their analogies with other bodies; and so as to be in relation with their physical properties, such as their specific volumes, specific heats, isomorphism. etc.'

GERHART, Emanuel Vogel, d.d.: clergyman; b. Freeburg, Penn., 1817, June 17; d. Freeburg, Penn., 1904, May 6: noted theologian of the Ger. Ref. Ch. He was graduated at Marshall Coll. 1838; was pres. of Heidelberg Coll., Tiffin, O., 1851–55, of Franklin and Marshall Coll. 1855–66, and in 1868 became prof. of systematic theol. in the seminary at Lancaster, Penn. For several years he was editor of the *Mercersburg Review*. Among his publications are *Philosophy and Logic* (1858); *The Reformed Church* (1863); *The Child's Heidelberg Catechism* (1882); and *Institutes of the Christian Religion* (1891).

GERICAULT, *zhā-re-kō'*, Jean Louis André Théodore: 1790–1824, Jan. 18; b. Rouen, France: painter. He studied painting with Carle Vernet 1808–10, then with Guérin, and 1816–19 in Rome. Early in his career he showed a strong passion for Rubens, and while yet a student exhibited his *Officier de Chasseurs à Cheval*, which attracted wide attention by its picturesque fidelity. in the Paris Salon. Two years later, 1814, this work was again placed on exhibition, and beside a realistic counterpart, *Cuirassier blessé*. Both pictures were bought for the Louvre. His enthusiasm in military subjects led him to enter the army for the Hundred Days' campaign, after which he went to Rome. While there, he painted

his great picture, *Course des Chevaux Libres*, and, on his return to Paris, exhibited his *Radeau de la Méduse*, which excited considerable hostile criticism. He spent two years in London with this painting, and there produced a large number of lithographs, returning to Paris 1822, and indulging in excesses that caused his death.

GERIZIM, *gĕr'ĭ-zĭm*, AND EBAL, *ē'bal:* two hills noted in Scripture story; separated by a narrow valley about 200 yards wide, in which stands the town of Nâbulus, the ancient Shechem or Sychar, metropolis of the Samaritan sect. They are nearly equal in height, not exceeding 700 or 800 ft. above the valley, which, however, is itself 1,800 ft. above the sea. The view from the top of Mount Gerizim, the southern hill, is said to be among the finest in Palestine, embracing glimpses of the blue Mediterranean on the w., the snow-capped heights of Hermon on the n., and on the e. the wall of the Trans-Jordanic mountains, broken by the deep cleft of the brook Jabbok.

In the Samaritan tradition, Mt. Gerizim was the scene of Abraham's offering of Isaac. This is contrary to the ancient and consistent Hebrew tradition, and to the belief that has been general among Biblical scholars, with the exceptions of a few eminent names—that Mt. Moriah, on which Solomon afterward built the Temple, was the place also of Abraham's offering. With Mt. Ebal, it was the scene of a grand and impressive ceremony, in which the whole people of Israel took part after crossing the Jordan, in obedience to a command of Moses. Half of the tribes stood upon the declivities of one hill; the rest occupied the sides of the other, while, in the valley between, the Levites, surrounding the sacred ark, pronounced, 'with loud voice,' the blessings affixed to the performance of the law, and the curses affixed to the neglect of it. (Deut. xi. 26–30; Josh. vii. 30–35.) According to the Mishna, their manner of procedure was as follows: They first turned toward Gerizim, and pronounced the blessing, whereupon the vast host that thronged the ascent of that hill rolled back their multitudinous 'Amen;' then turning toward Ebal, they uttered the corresponding malediction, to which the tribes there stationed responded in deep and solemn tones. In this way, alternating blessing and curse, they went through the whole series. The more full prescription for the ceremony, in Deut. xxvii., gives only the curses—the customary explanation of which fact is that probably these were merely the reverse form of the blessings, and may have been selected by the writer of the book on account of the greater awe inspired among a rude people by a malediction, than a benediction. At a later period, the Samaritans, by permission of Alexander the Great, built a temple on Mt. Gerizim, as a rival to that of Jerusalem, and organized a rival priesthood. And though this temple was destroyed by Hyrcanus about 200 years afterward, the mountain on which it stood continued to be held sacred by the Samaritans. It was to Mt. Gerizim that the 'woman of Samaria' referred when she said

to our Saviour: 'Our fathers worshipped in *this* mountain, and ye say that in Jerusalem is the place where men ought to worship.' (Jno. iv. 20.) Subsequently, a Christian church in honor of the Virgin was built on it, which Justinian surrounded with a strong wall to protect it against the assaults of the Samaritans, who were even then a powerful and important sect. The ruins of this wall are still visible.

GERLACH, *gĕr'lâch*, Ernst Ludwig von: 1795, Mar. 7—1877, Feb. 18; b. Berlin: publicist. He was active in the politico-religious movement in Germany from an early age; wielded great influence as a journalist for many years; was a member of the first Prussian chamber, 1849, and of the Urfurt parliament, 1850, was conspicuous as an opponent of the reactionary movement, 1851; held important civil offices 1865–73; and 1874 published a pamphlet in opposition to the govt. for which he was prosecuted, heavily fined, and dismissed from public service.

GERLACHE, *zhĕr-lâsh'*, Etienne Constantin, Baron de: 1785, Dec. 26–1871; b. in the province of Luxemburg, Belgium. In 1824, he was elected deputy from the province of Liege, to the second chamber of the 'States General,' supporting the Rom. Cath. party, of which he was considered a leader. At the time of the Revolution, Gerlache presided over the committee appointed to revise the constitution, and was head of the deputation sent to offer the crown to Prince Leopold of Saxe-Coburg. In 1831, he became pres. of congress, and in that capacity received the oath exacted from the king by the constitution, and the following year was appointed first pres. of the 'Court of Cassation.' In 1843, the king conferred on him the title of baron. In 1867, he retired from his office and from politics. Gerlache had a literary reputation. His most important works are: *Mémoires sur les Changements á apporter aux Tarifs du Royaume* (1821–24); *Histoire du Royaume des Pays-Bas* (1839).

GERM, n. *jėrm* [F. *germe*—from L. *germen*, the bud of a tree, a young twig: It. *germine*]: that from which anything springs; origin; first principle; a bud or shoot (see Embryo). Germ-cells, the cells which contain active germinal matter or protoplasm and a nucleus or kernel. Germ-mass, the materials prepared for the formation of the embryo. Germ theory: see below. Germen, n. *jėr'mĕn*, in *bot.*, old name for the ovary. Germinate, v. *jėr'mĭ-nāt* [L. *germĭnātus*, sprouted forth, germinated]: to bud or sprout; to begin to grow; to vegetate; to cause to sprout. Ger'minating, imp.: Adj. sprouting or vegetating. Ger'minated, pp. Ger'minal, a. *-mĭ-năl* [F.—L.]: pertaining to a germ. Ger'minant, a. *-nănt*, sprouting; germinating. Ger'mina'tion, n. *-nā'shŭn* [F.—L.]: the act of sprouting; the time of vegetating; the first appearance of vegetation or of growth of a new plant from seed that has been planted (see Seed: and as regards acotyledonous plants, Spore). Germinal vesicle, in *bot.*, and *zool.*, a cell contained in the embryo-sac, from which

the embryo is developed; the small vesicular body within the ovum or the yelk of the egg; the nucleus of the ovum.

GERMAN, a. *jėr′măn*, also GERMANE and GERMAIN, a. *jėr′mān′* [L. *germānŭs*, sprung from the same stock: F. *germain*, german: It. *germano*, true, natural, a brother]: of the first degree of relationship; of the same stock; nearly allied; natural (the term has no relation to German—Teutonic). COUSINS-GERMAN, the sons or daughters of brothers or sisters; cousins having the same grandfather. *Note.*—In *general use*, GERMAN is applied to cousins; and GERMANE to affairs, as, 'it is not at all germane to the subject.'

GERMAN, n. *jėr′măn:* a native of *Germany;* also the language. GER′MANISM, n. *-ĭzm*, an idiom of the German language. GERMAN′IC, a. *-ĭk*, pertaining to Germany.

GERMAN, SAN, *sân chĕr-mân′:* town in the s.w. of the island of Porto Rico; lat. 18° 10′ n., long. 67° west. It is about 10 m. from the sea, in the centre of a district productive in cotton, coffee, and cattle. Pop. estimated 10,000.

GERMAN, EDWARD, English composer: b. Whitchurch, Shropshire, 1862, Feb. 17. He was educated at the Royal Academy of Music and since his graduation in 1887 has conducted at many important English musical festivals. He has been a prolific composer, among his works being the music to Irving's productions of *Richard III.; Henry VIII.; Much Ado About Nothing,* and *Romeo and Juliet;* music to *Nell Gwyn* (1900); *The Emerald Isle,* with Sullivan (1901); *Symphonic Poem; Hamlet* (1897); *Symphonic Suite; The Seasons* (1899); *Operetta, The Rival Poets* (1901); *Rhapsody on March Themes* (1902); *Welch Rhapsody* (1904); *Just So Song Book* (with Rudyard Kipling); etc., and the operas *Merrie England* (1902); and *A Princess of Kensington* (1903).

GERMAN BAPTIST BRETHREN (their own name simply 'Brethren'; by outsiders often called Dunkers or Dunkards, German *Tunkers* or 'dippers,' as immersion Baptists), a flourishing sect of German origin, in the United States, located chiefly from Pennsylvaina to Virginia, in the central West from Ohio to the Rockies, and in North Dakota. They number about 1,100 congregations, 3,000 ministers, and 115,000 members, mostly farmers. They support seven colleges,—Elizabethtown and Huntington, Pa.; Uniontown, Md.; Bridgewater, Va.; Mount Morris, Ill.; Manchester, Ind.; and McPherson, Kan.; missions in France and Switzerland, Scandinavia, Asia Minor, and India, with a mission endowment fund of over $250,000; and a publishing house at Elgin, Ill., which issues their organ, the *Gospel Messenger.*

The sect was the product of the great outburst of religious zeal and mysticism in the German Lutheran Church near the end of the 17th century. It began with Alexander Mack, a miller of Schwarzenau on the Eder, in the little principality of Wittgenstein west of Hesse-

Cassel. Wittgenstein was a curious nest of zealots, mystics, hermits, etc.; and in 1708 Mack baptized eight like-minded companions in the Eder. The sect—whose vital principle, like that of the Quakers and Mennonites, was rejection of creeds and reliance on the 'inner light,' abhorrence of war, litigation, oaths, and sumptuous living, and return to primitive simplicity and the Golden Rule—grew rapidly; but the authorities forbade the public baptisms, and they withdrew to Crefeld beyond the Rhine, another great home of dissent. In 1719 part of the band came to Pennsylvania and settled among the Mennonites near Germantown, founding a 'prayer-house' in 1723. The rest followed by 1729. Thence they pushed south and west. One of them was Christopher Saur, whose German press, established 1638, printed the first European Bible in America.

In doctrine the Brethren are simply orthodox Protestants; they accept the Bible as the verbally inspired utterance of God, the Trinity, and reward or punishment in a future life. Grace is free to all; the only requisites are faith, repentance, and baptism by immersion, hence the latter is for converted adults only. The Lord's Supper is an evening meal preceded by mutual foot-washing (each sex separate), and followed by the right-hand of fellowship and the kiss of peace, and then by communion. Their organization is episcopal, the bishops or elders being elected by the members out of the higher of two grades of ministers, who with the deacons are also elected by the congregations. The latter with the State districts elect delegates (of either sex) to an annual conference, which is the binding legislative and executive authority on a two-thirds vote.

In the early eighties it divided into two sects. The Old Order Brethren objected to its humanitarian, missionary, and Sunday-school activities; the Progressive Brethren to the rules of dress and other conservative decisions of the conference. The Old Order, publish a newspaper, the *Vindicator*, to oppose education, missions, Sunday-schools, and revivals. The Progressives are increasing at the expense of the 'Conservatives,' or mother body. They support a college and publishing house at Ashland, Ohio, and issue an organ, the *Evangelist*.

GER'MAN CATHOLICS: religious sect which in recent years in Germany has come out from the Rom. Cath. Church. Though retaining the designation Catholic—i.e., universal—they form independent congregations, and commonly style themselves Catholic Apostolic Christians. So far as their general refusal of the Roman obedience is concerned, the German Catholics stand on Prot. ground; but neither in theory nor in practice are they evangelical Protestants, nor do they wish to be accounted such.

Whatever might be the deeper causes of the schism, the immediate occasion of it was the exhibition of the Holy Coat at Treves. In 1844, Bp. Arnoldi appointed a special pilgrimage and service to this relic, to be preceded by con-

fession and remission of sins. This proceeding called forth a protest from Johann Ronge (pronounced Rongé, the *g* hard), Rom. Cath. priest in Silesia, who, having quarrelled with the authorities of his church, had been suspended from his office, and was living in retirement. Ronge addressed a public letter to Bp. Arnoldi, 1844, Oct. 1, in which he characterized the exhibition of the coat as idolatry. Ronge's voice found response in the minds of many Rom. Catholics; and a congregation of his adherents was formed at Breslau about the beginning of 1845.

A short time previous to the publication of this letter, Johann Czerski, a priest at Schneidemühl, in Posen, who also had come into collision with the authorities of his church, had seceded, and was about to form a 'Catholic Apostolic Christian' congregation. Czerski and Ronge were naturally drawn into confederacy. Ronge at last addressed an appeal to the lower orders of the priesthood, calling upon them to use their influence in the pulpit and everywhere to break the power of the court of Rome and priestcraft in general, throughout Germany; to set up a national German Church independent of Rome, and governed by councils and synods; to abolish auricular confession, the Latin mass, and the celibacy of the priests; and to aim at liberty of conscience for all Christians, and perfect freedom for the religious education of children.

A congregation of Czerski's followers had been formed at Schneidemühl, with a doctrinal symbol differing little from that of Rome. The Holy Scriptures and the Nicene Creed were held to be the only standards of Christian faith, and were to be understood in the sense patent to every enlightened and pious Christian. Nothing was said against the worship of saints and relics, pilgrimages, confession, etc. This Confession of Schneidemühl served many other congregations as a groundwork, though some of them modified it in various ways. The new sect quickly increased. At the begining of 1845, more than a hundred congregations were in existence. The congregation formed at Breslau under Ronge completely departed from the doctrine and ritual of the Rom. Cath. Church. The Scripture was declared the only rule of Christian faith, and no external authority was to be allowed to interfere with the free interpretation of it. The essentials of belief were restricted to a few doctrines: belief in God as the Creator and Governor of the world, and the Father of all men; in Christ as the Savior, in the Holy Spirit, the holy Christian Church, the forgiveness of sins, and eternal life. Baptism and the Lord's Supper were held to be the only sacraments. Confirmation was retained, but most of the Roman rites and practices were given up.

The need of something like concert being felt, the first council of German Catholics was held at Leipsic 1845, Mar. 22, attended by delegates from 27 congregations, others signifying their willingness to abide by the decisions that might be come to. Only two or three of the delegates were in clerical orders. With the idea that a Christian church

could be founded only on a doctrinal system, the principles of the Breslau Confession were mostly adopted. The interpretation of Scripture, the only source of Christian belief, was left to the free exercise of reason, pervaded and actuated by the 'Christian idea.' Forms of worship were to be adapted to the requirements of time and place. In church government, the council declared for a presbyterial and synodal constitution. The congregations were to have the free election of their clergy and eldership. But Czerski refused to sign the doctrinal symbol of the Leipsic council, declaring that it ignored the divinity of Christ: his congregation held to their original name, 'Catholic Apostolic Christians.'

The German Cath. congregations increased, numbering in Germany 173 in 1846, June. Some leading Rom. Catholics, professors, and others, joined the movement; and learned Protestants, like Gervinus, looked upon it as a momentous event in the history of Germany. Individual Protestant clergymen went over to the body; and all those Protestants who, from dissatisfaction with the state church, had formed what are called 'free' or independent congregations, entered more or less into relations with it. The local boards and magistracy also showed favor to the cause, and often supported it by granting the use of Protestant churches, and even funds. But German Catholicism was destined to soon to find enemies both within and without. Orthodox Catholics, even when doubtful as to Rome, were more distrustful as to the essential Christianity of the new system; and conservative Protestantism began to suspect it as an undermining of religion in general, and dangerous to the welfare of 'church and state.' And as the movement fell in with the liberal tendencies of the times in general, the governments took the alarm, and set themselves to check its spread. Saxony took the lead, and Prussia soon followed, in imposing vexatious, and even tyrannical restrictions upon the 'Dissidents,' as they were styled by the authorities. In Baden, they were even denied the rights of burghers, while Austria, then pre-eminent in religious bigotry, sent them out of her territories.

Internal disagreements even more than state persecutions, checked the prosperity of German Catholicism, as was indicated in the wide discrepancy between the views of Czerski and those of Ronge. Czerski and his adherents held closely by the doctrines and ritual of Rome, and issued successive symbols more and more definite in doctrine. Ronge's party made equal approach to the Rationalists, and, leaving the province of religion altogether, occupied themselves with free-thinking theories and democratical politics. This led to numerous disagreements between congregations and clergymen, and checked the spread of the movement. When the second council was held in Berlin 1847, the interest had greatly declined.

When the storm of 1848 burst, the German Catholics had free space for their exertions, which took mostly a political direction. Ronge was active in travelling and preach-

ing, and though his free-thinking and political tendencies were repudiated by numbers of the body they predominated in many places, and found expression in a series of publications, among others, in Rau's *Catechism of the Christian Religion of Reason*, and Schell's *Book of Religion*. After the political reaction set in, strong measures were taken against the German Catholics. The early enthusiasm of the movement had passed, and after the dissolution of the Frankfurt parliament, Ronge retired to London. In 1850 a conference was held at Köthen between the German Catholics and the 'Free Congregations' (*Freie Gemeinden*), an association of free-thinking congregations which had been gradually forming since 1844 by secession from the Protestant Church. The immediate issue was a close confederation of the two bodies, followed 1859 by an incorporative union of German Catholics and Free Congregations under the name *Association of Free-Religious Congregations*. At this time the whole number of the congregations in the united body was 104; they received few subsequent additions, and are in a very unprosperous condition. See Kampe's *Geschichte des Deutsch-Katholicismus*.—See OLD CATHOLICS: DÖLLINGER.

GERMANDER, n. *jėr-măn'dėr* [F. *germandrée*—from It. *calamandrea*], (*Teucrium*): genus of plants of nat. ord. *Labiatæ*, having the calyx tubular, 5-toothed and sometimes 2-lipped; the corolla with the upper lip very short and bi partite, the lower lip spreading and trifid; the stamens much exserted. The species are numerous and very widely distributed. The COMMON G. or WALL G. (*T chamædrys*), found on ruined walls, is probably from s. Europe. It is a small, almost shrubby, perennial; with wedge-shaped ovate inciso-serrate leaves, and whorls of about three large reddish purple flowers. It is bitter, somewhat aromatic, and was formerly much used in medicine, particularly as a principal ingredient in a famous gout medicine called *Portland Powder*.—Similar medicinal virtues were ascribed to *T. Botrys*, a small annual species common on dry hills in Germany; with aromatic fragrance and yellow .flowers. WOOD G. or WOOD SAGE (*T scorodonia*) is a common British plant, growing in dry bushy or rocky places, with oblong-ovate very much wrinkled leaves, and one-sided racemes of yellowish-white flowers. It is very bitter, slightly aromatic and is used in the island of Jersey instead of hops.—WATER G. (*T. scordium*), growing in wet meadows, has a smell resembling that of garlic: it had formerly a great reputation in medicine.—CAT THYME (*T. Marum*), native of s. Europe, abounds in a pungent volatile oil, has a camphor like smell, and—like catmint and valerian root—has great attractiveness for cats. It is often used as a sternutatory; and its powder snuffed into the nose has proved beneficial in cases of polypus.—A species found in Cochin-China (*T. thea*) is used there in infusions as tea. *G. speedwell* is a species of Veronica.

GERMANE, a. *jėr'mān:* nearly related: see GERMAN.

GERMAN EAST AFRICA.

GERMAN EAST AFRICA, the largest German colonial possession, extending from lat. 1° to about 11° 41′ S., and from long. 29° to 40° 40′ E. It has a coast line of 620 miles, and lies between British East Africa, Indian Ocean, Portuguese, East Africa, Rhodesia, Congo Free State, and the British Sudan. The area is 384,000 square miles. The German Empire is represented by an imperial governor, who appoints a council of five in each of nine communes. There is a military force of 232 Germans and 2,000 natives. The region produces almost every kind of tropical fruit, fibres, sugar, tea, etc. The chief seaports are: Dar-es-Salaam (pop. 13,000); Bagamoyo (pop. 14,000); Saadani, Pangani, Kilwa (pop. 10,000 each), and several smaller towns. A railroad from Tauga is open for traffic to Muhesa and Korogme, 54 miles. There are nine telegraph stations in the coast towns. The trade is chiefly with Zanzibar and Germany. Pop. 6,750,000 natives, 15,500 foreigners, mostly Arabs, Syrians, and Loanese.

GERMAN EMPIRE. See GERMANY.

GERMAN EVANGELICAL SYNOD OF NORTH AMERICA: ecclesiastical body constituted 1840, Oct. 15, at Gravois Settlement, near St. Louis, Mo., by six German ministers—at first under the name Evangelical Church Association of the West, which in 1860 was changed to German Evangelical Synod of the West, and in 1877 to its present name. The following declaration of faith was adopted by the founders, and still serves as its confessional basis: 'The German Evangelical Synod of North America as a part of the Evangelical Church means by the term Evangelical Church *that* church community which acknowledges the Holy Scriptures of the Old and New Testament as the word of God, and as the only and infallible standard of Christian doctrines and precepts, and accepts as its confession *that* interpretation of the Holy Scriptures which is laid down in the symbolic books of the Lutheran and Reformed churches, among which the Augsburg confession, Luther's small catechism and the Heidelberg catechism are the principal ones, *as far as they agree;* but in points of difference the German Evangelical Synod adhere solely to the passages of Holy Scripture alluding to them, observing that liberty of conscience existing in the Evangelical Church.' According to this confession of faith the German Evangelical Synod accepts as its doctrine the *consensus fidei* of the Lutheran and Reformed churches confesses with the church of the Reformation God as the Almighty Creator of heaven and earth, the doctrine of the fall of man, of original sin, of redemption through the atoning blood of Christ, and the Christology as the same was formed by the ecumenical councils of the first centuries. Thus the German Evangelical Synod establishes a union between the Lutheran and Reformed churches similar to that which is in existence with few exceptions in the churches of the different states of Germany. As is well known, the two branches of the church of the Reformation

agree in all fundamental doctrines of Christian life and faith, and on all subjects and facts found clearly stated in the Holy Scriptures which are necessary for our salvation. The controversy centres especially around the doctrine of the Holy Supper. The German Evangelical Synod believes that in the Lord's Supper the faithful and penitent communicant receives under the bread and wine the body and blood of Christ; but it leaves unanswered the question how this is done, since on that question the Scriptures furnish us with no answer.

Every congregation binds itself voluntarily to the doctrines and precepts as laid down in the statutes of the German Evangelical Synod when it joins this body; but every congregation retains independence in the management of its own affairs. A number of congregations within certain geographical boundaries constitute a 'district,' whose ministers and lay delegates meet annually in district conference. All the districts together are represented by the 'general synod,' which is composed of one out of every 9 ministers and 1 lay delegate for every 9 congregations, elected at district conferences. It convenes every 3 years. The general synod has exclusive control of the management of those institutions which are not the sole property of any one district, but receive support from all parts of the synod, e.g., seminaries, foreign and home missions, support of invalid pastors and teachers, provision for pastors' widows and orphans, the publishing house, etc.

The theological seminary, founded 1850 at Marthasville, Mo., was removed in 1883 to St. Louis, Mo. It has a three years' course of study. At Elmhurst, Ill., is located the preparatory college for students purposing to enter the theological seminary, the course of study being 5 years. At this institution the teachers of the parochial schools also receive their education. The book concern and publishing house (Eden Publishing House) is at St. Louis, Mo.

GERMANIA, *jėr'-mā'nĭ-a:* general name under which the Romans designated, not only a great part of modern Germany, but also a portion of Belgium and the n. and n.e. districts of Gaul; the last two being especially characterized as 'Germania Prima' and 'Secunda,' while Germany proper was called 'Germania Magna,' 'Germania Trans-Rhenana,' or 'Germania Barbara.' The boundaries of the region comprehended under these designations were: On the w., the Rhine and Celtic Gaul; on the e., the Vistula and the Carpathian Mountains; on the s., the Danube; and on the n., the sea, which was divided by the Cimbrian Chersonesus (Jutland) into the German and the Suevic (Baltic) seas. The first occurrence known in connection with the history of the people of Germania was the appearance of warlike tribes of Cimbri and Teutones in the present Steiermark or Stiria, where they defeated the Roman consul Papirius, B.C. 113. Eleven years later, they again came into collison with the Roman arms, but the result was their signal defeat by Marius. The names Germani and Ger-

mania do not seem to have been appellations in use among the people themselves; and it is probable that the Romans borrowed them from the Gauls or Celts, in whose language the word 'gairm,' a loud cry (like the Homeric *boèn agathōs*, 'good at the war-shout'), may possibly have served to designate this people, whose habit it was to accompany their attack on an enemy by loud cries. The Tungri were the first German people that crossed the Rhine, but other tribes soon followed; and when Julius Cæsar opened his Gallic campaigns (B.C. 58), he found the Germanic nations of the Triboci, Nemetes, and Vangiones in possession of the districts between the left bank of the Rhine and the Vosges, while he even encountered a rival pretender to the supremacy of Gaul, in the person of Ariovistus, leader of the Suevic tribe of the Marcomanni. All these tribes were finally reduced to subjection, with the rest of Gaul, while the Tencteri and Usipetes, who had invaded Belgium, were driven, together with the Sicambri, across the Rhine to their former settlements by the victorious general, who for the first time (B.C. 35) led a Roman army into Trans-Rhenic Germany. The quiet which Cæsar's victories had secured in the Rhenish districts was again so seriously disturbed by the Usipetes and several neighboring tribes B.C. 16, that Augustus, who had hastened to Gaul on the outbreak of disturbances, saw that stringent measures must be adopted to keep the Germans in check, and sent Drusus, at the head of eight legions, into Germany. The first step of the Roman general was to dig a canal ('fossa Drusiana') from the Rhine to the Yssel, by which the Roman galleys could sail from the heart of the continent to the ocean; and so successful were his measures, that in the course of four campaigns he had carried the Roman arms as far as the Albis (Elbe), subdued the Frisii, Batavi, and Chauci in the n., and defeated the Catti of the Moenus (Maine) districts. Drusus (d. B.C. 9) began the series of forts, bridges, and roads which were completed and extended under succeeding commanders. The attempt made by Varus, under the direction of Augustus, to introduce the Roman provincial forms of administration into Germany, brought, however, a sudden check to the advance and consolidation of Roman power; for the tribes of central Germany, indignant at this attempted subversion of their national institutions, ranged themselves under the leadership of Arminius, a chief of the Cherusci, who organized a general revolt. The result was the destruction, at the Saltus Teutobergiensis, of the three legions commanded by Varus, and the subsequent loss of all the Roman possessions between the Weser and the Rhine. The news of this disastrous event threw the city of Rome into consternation. Germanicus, who was sent forth A.D. 14 to restore the Roman supremacy, would probably have again wholly subjugated the Germanic tribes had he not been recalled by Tiberius in the midst of his victories. From this time, the Romans ceased their attempts to conquer Germany, and contented themselves with repelling the incursions of the tribes on their fron-

tiers, and endeavoring by their influence to foster the intestine disturbances which were perpetually generated through the ambition and jealousy of rival leaders, such as Arminius, Marbodius, and the Goth Catualda. After the murder of Arminius, by his own people, the power of the Cherusci declined, while the Longobardi and Catti began to assert a recognized preponderance among the neighboring tribes. Occasional encounters took place between the people of central Germany and the legions who guarded the well-protected Roman boundary-line, which extended from the Rhine to the Taunus, and thence to the Danube; and from time to time the Batavi and other warlike tribes of the n. and n. w., who, like them, had been brought into partial dependence on the Romans, rose in formidable insurrection. But after Trajan had restored order and strengthened the forts, peace remained undisturbed in the n. till the beginning of the 3d c., while, with the exception of the sanguinary war of the Marcomanni and Quadi, under Aurelius Antoninus, A.D. 166, there was a similar absence of hostilities in the south. But with the 3d c. the tide of war turned, and the Romans were compelled to defend their own empire from the inroads of the numerous Germanic tribes, foremost among whom were the powerful confederacies of the Alemanni and Franks. In their track followed, during the next two centuries, successive hordes of the Vandals, Suevi, Heruli, Goths, and Longobards, who soon formed for themselves states and principalities on the ruins of the old Roman provinces. From this period till the establishment of the western empire in the person of Charlemagne, the history of Germany is a blank; but the condition of the country when he entered on his German patrimony showed that since the retirement of the Romans the smaller tribes had become gradually absorbed in the larger, for on his accession the land was held by a few great nations only, as, the Saxons, Frisians, Franks, Suabians, and Bavarians, whose leaders exercised sovereign power within their own territories, and in return, for military services, parcelled out their lands to their followers.

The knowledge which we possess of the habits and government of the ancient Germans is derived principally from the Commentaries of Cæsar and the 'Germania' of Tacitus; and imperfect as these sources of information are, they are far less contradictory than the subsequent records of the earliest Christian times. According to the Roman historians, the Germans were a people of high stature, fair complexion, and red or yellow hair, endowed with great bodily strength, and distinguished for an indomitable love of liberty. The men delighted in active exercise and the perils of war; and the women, whose chastity was without reproach, were held in high esteem. Each master of a family had absolute power over those of his household. Their habitations were generally separate, and surrounded by their several stalls and garners; for though there were villages whose inhabitants made common use of the fields and woods surrounding them, the Germans seem to have

preferred isolated and detached dwellings to aggregate settlements. Towns and cities they long regarded with aversion, as inimical to personal freedom. In regard to their political organizations, it appear that several villages formed a 'hundred,' several hundreds one 'gau,' and several gaus one tribe. In each tribe the people were divided into four classes—nobles, freemen, freedmen or vassals, and slaves. The king or chief was elected from among the nobles; but his power was very limited, and the government of the several tribes seems to have been democratic rather than monarchical.

The religion of the Germans, which is shrouded in great obscurity, points, like their language, to their eastern origin and was based on Asiatic myths of the creation of the world and the existence of gods having the forms and attributes of a perfect humanity. Their conceptions of these mythical beings were modified by the local coloring which they received from association with new scenes and through the lapse of time; hence the different tribes all had their special gods or demigods, often their own leaders or chiefs to whom the attributes of the god to whose worship they were most partial were ascribed. It is generally said that the Germans had neither temples nor statues. Both Cæsar and Tacitus expressly affirm this, but it cannot be literally true, for Tacitus himself mentions a temple of a goddess Tanfana among the Marsians; and at a later period, we find Christian missionaries exhorting the Germans to change their pagan temples into Christian churches, while we also read of the destruction of pagan idols. Nevertheless, their religious rites were mainly in the open air—in groves and forests, and on heaths and mountains. Although a priestly order also existed among the Germans, yet each master of a household performed religious services for himself and his family within his own homestead. A knowledge of the will of the gods and the events of the future was sought by divination from observations of the flight of birds, the rushing of waters, and other similar signs, in the interpretation of which women were thought especially skilled. Belief in a future life, and in an abode after death for those who had deserved well in this life, was cherished among the Germanic races, who had a strong faith in retributive justice, whose sway they believed would be extended over the gods by involving them in a universal annihilating conflict as the punishment of their evil deeds, after which a new world was to arise guarded by a pure and perfect race of gods. In addition to the higher deities, the Germans peopled every portion of space with a class of subordinate beings who pervaded the earth, air, and water, in the shape of elves, nixes, kobolds, dwarfs, and giants; while Nornes and Valkyries stood apart from either grade of spiritual existence as the representatives of destiny like the Moiræ and Parcæ of the Greeks and Romans.—See Kuhn, *Zur altesten Gesch. d. indogerman. Völker* (Berlin), 1850; Wackernagel, *Familienlebend. Germanen* (Freibr, 1846); Gibbon's *Decline and Fall of the Roman Empire*; Grimm, *Deutsche Mytholo-*

gie (1844); Müller, *Altdeutsche Religion;* the *Deutsche Mythologie* of Simrock (1855) and of Holtzmann (1874.)

GERMANICUS CÆSAR, *jĕr-măn'ĭkŭs sē'zar:* Roman general, belonging to the imperial family: B.C. 15, Sep.—A.D. 19, Oct. 9; son of Nero Claudius Drusus and of Antonia, daughter of Mark Antony and niece of Augustus. In accordance with the desire of Augustus, who had even thought of making him his successor, he was adopted A.D. 4. by Tiberius, whom he accompanied in the war against the Pannonians and Dalmatians, for the purpose of securing the German frontiers after the defeat of Varus. After having been consul A.D. 12, he was appointed in the following year to the command of the eight legions on the Rhine. On the death of Augustus A.D. 14, the soldiers revolted demanding higher pay and a shorter period of service. Germanicus hastened from Gaul (where he happened to be at the time) to remind them of their duty. The soldiers, who almost idolized him for his frank and generous disposition, urged him to seize upon the supreme power. Germanicus, however, was incapable of treachery, and declared that he would rather die than forfeit his allegiance. He, however, granted their demands, though his colleague, A. Cæcina, secretly massacred the ringleaders at night. Germanicus now led the legions over the Rhine below Wesel, attacked the Marsi during a nocturnal festival, and destroyed their celebrated temple of Tanfana. A.D. 15, he made a second inroad into Germany. Proceeding from Metz into the country of the Catti, he destroyed their chief town, Mattium (Maden, near Gudensberg), slaughtering all the inhabitants, young and old. On his return his assistance was implored by the ambassadors of Segestes (always a firm ally of the Romans), who was besieged by his son-in-law, Arminius, conqueror of Varus. Aid was at once given, and Thusnelda, heroic wife of Arminius, fell into the hands of the Roman general. Arminius, burning with anger and shame, now roused the Cherusci and all the neighboring tribes to war. Germanicus, in consequence, began a third campaign. He divided his army into three divisions. The main body of the infantry were led by Cæcina through the country of the Bructeri, the calvary under another general marched through Friesland, while Germanicus himself sailed with a fleet through the Zuydersee into the German Ocean, and proceeded up the river Ems, where he joined the others. The united divisions now laid waste the country in the neighborhood of the Teutoburg forest, penetrated into its gloomy depths, and gathering up the bones of Varus and his legions, which had lain bleaching there for six years, buried them with solemn funeral honors. A victory gained by Arminius induced Germanicus to make a hasty retreat, during which he lost part of his fleet in a tempest. Cæcina, who retreated by land, sustained severe losses at the hands of the pursuing Germans. Before the fleet of 1,000 vessels, which Germanicus had built in Batavia, was equipped, he was recalled over the Rhine A.D. 16, by news of the beleaguerment of the recent-

ly acquired fortress of Aliso, on the Lippe. The Germans were repulsed, but the funeral mound in the forest of Teutoburg, which they had thrown down, was not restored. Germanicus now sailed with his fleet again into the Ems, pressed forward to the Weser, which he crossed, and completely overthrew Arminius in two battles. Nevertheless, he determined to return, and on his way again lost the greater part of his fleet in a great storm. In order to prevent this event from giving courage to the Germans, he once more, in the same year, marched into the country of the Marsi, and dispatched his lieutenant, Silius, against the Catti. The victories thus achieved were to have been followed up in the succeeding years, but Tiberius, jealous of his glory, recalled him, and feigning good will, bestowed on him the honor of a triumph, in which Thusnelda appeared among the captives. To rid himself of Germanicus, whose popularity seemed to render him dangerous, Tiberius sent him. A. D. 17, with extensive authority, to settle affairs in the East, at the same time appointing Piso viceroy of Syria, whose haughty and despotic character every where counteracted the influence of Germanicus. Germanicus died at Epidaphnæ, near Antioch, probably of poison. He was deeply lamented both by the inhabitants of the provinces and by the citizens of Rome, whither his ashes were conveyed, and deposited by his wife Agrippina in the mausoleum of Augustus. Agrippina herself and two of her sons were put to death by order of Tiberius; her third son, Caligula, was spared. Of the three daughters who survived their father, Agrippina became as remarkable for her vices as her mother had been for her virtues. Besides his splendid generalship, Germanicus was conspicuous for his magnanimity, benevolence, finely cultured understanding, and personal purity of life. He wrote several rhetorical works which have been lost; but of his poetical works we possess an epigram, a version of the *Phænomena* of Aratus, and fragments of a work of the same character, entitled *Diosemeia*, or *Prognostica*, compiled from Greek sources. Germanicus's literary remains were published first at Bologna 1474. The latest edition is that of Orelli, at the end of his Phædrus (Zurich 1831).

GERMANIUM, *jėr-ma′nĭ-ŭm*, a metallic chemical element discovered in 1886 by Dr. Winkler in a silver ore (argyrodite); symbol, Ge; atomic weight, 72.3. It has a melting-point about 1,650° F. (900° C.); is oxidized when heated in air; crystallizes in octahedra; has a perfectly metallic lustre, and is of a grayish-white color. As gallium had been named from France, the new metal was named after Germany. Fifteen years before its discovery its existence was prophesied by Mendeleëff.

GERMAN LITERATURE: see under GERMANY.

GERMAN MEASLES or RUBEOLA, also known as EPIDEMIC RËSEOLA or RÖTHELN: this is an acute eruptive disease with fever, not unlike regular measles, which develops after an incubation period of from one to three weeks. It begins with slight fever and catarrhal symp-

toms, also sore throat, pains in the limbs, and the appearance of an eruption similar to measles, but lighter in color and not arranged in crescentic masses. It disappears without any scaling off of the skin in about seven days.

Fever, headache, and muscular pains all over the body, are the initial symptoms. The eruption usually appears first on the scalp and sides of the face, then on the hands and forearms, spreading rapidly over the rest of the body. The character of the eruption is such that at first it may be thought to be that of scarlatina as it consists of rosy itching papules, variously dispersed and grouped. There is a difference, however, especially to the touch. Scarlet fever has a smooth surface, whereas that of German measles is slightly roughened, but not so much so as in regular measles, and the color of the eruption is also lighter. Another point of differentiation is the fact that the eruption in scarlet fever invariably appears on the chest first, this being often followed immediately by a redness of the hands. There is slight fever, but not nearly so high a temperature is reached as in scarlet fever. There is sore throat with congestion of the eyeballs. The sore throat, however, is usually not severe, neither are there patches of ulceration, as is frequently to be found with the onset of scarlet fever.

The duration of the eruption is about three days, and by the end of seven or eight days, the disease is usually over. German measles, while not very severe, is usually remarkably contagious, often becoming epidemic.

GERMAN MUSIC: see MUSIC.

GERMANO, SAN, *sân jĕr-mâ'nō*, or CASINO, as is it now generally called: beautiful and prosperous town of Italy, at the base of Monte Casino, province of Caserta, about 50 m. n.n.w. of Naples. It contains handsome public edifices, and is surrounded by the remains of monuments and buildings of high antiquarian interest; it is built on the site and from the ruins of the ancient Volscian town, Casinum, or Casca. The principal ruins of the ancient Volscian period are a monument, supposed to have been a tomb, an amphitheatre, and a temple. The monumental building is now used as a church; it is square, in the form of a Greek cross, constructed with enormous squared blocks of stone, on the Cyclopean principle. From its form, it is called the Church of the Crucifix, or *Crocefisso*. The amphitheatre must have been a magnificent building, and it is still in a state of preservation sufficient to give an idea of its original vast proportions. The temple, adjoining the amphitheatre, was built probably in conjunction with it, at the cost of the Volscian matron, Umidia Quadratilla, mentioned by Pliny. The Benedictine monastery of Monte Casino, two m. from San Germano, is one of the most renowned religious communities of Europe. Its foundation by St. Benedict dates from 529. It contains one of the most beautiful churches of Italy, and an extensive library, and in its archives a collection of the most precious documents of the middle ages. The district surrounding San Germano is highly

cultivated and beautiful. Pop. about 10,000. See CASINO or MONTE CASINO.

GER'MAN OCEAN: See NORTH SEA.

GERMAN PAINTING AND SCULPTURE: Under Charlemagne the first attempt was made to produce a characteristic German style, which was based upon a direct and conscious imitation of late Roman art. Under the Ottoman Empire a second weighty element became the influence of Byzantine models.

In the 9th and 10th centuries bishops and abbots were the chief patrons of art. A large part of the income of the cloisters was devoted to decorative purposes. The first inspiration to monumental works in plastic was likewise due to the taste and erudition of the church. Bishop Bernward (d. 1023) became the centre of an art movement of enduring value, as is attested by the Bernward's column, the bronze doors, and various other works of the cathedral in Hildesheim. This art, containing strong Byzantine reminiscences, influenced by late Roman models, but transformed by the glowing imagination of the North into a new beauty, was the first flower of the Romanesque period, in which we can generally class all the works of the 11th and 12th centuries in Germany. The oldest work of German easel painting belongs to this period—the wooden Antependium in Soest (1166).

About the middle of the 13th century the Gothic, entering Germany from France, celebrates its triumph over Romanesque ideals. The most important plastic works of Gothic Germany are to be found in its cathedrals. First among these is the portal of the minister in Freiburg i. Br. (c. 1270) unsurpassed in feeling and grace in German Gothic. Strassburg, Mainz, Nuremberg and Brunswick follow with portals and façades covered with a wealth of decorative figures. The subjects are drawn from Biblical legend and scholastic dogma.

In the field of painting the illustration of sacred books and classic poets occupied numberless miniaturists. Repressed by the conditions of Gothic architecture, fresco decoration did not flourish. The leadership fell to easel-painting, and soon wooden altar-pieces of monumental size filled the churches. In the 14th century three cities became the centres of art development, Prag, Nuremberg, and Cologne. History begins now to record the names of individual artists. Under Charles IV Nicolas Wurmser enjoyed great popularity. The Nuremberg local school evinced earnest endeavor to depict nature and to discover the laws of its proper presentation. Foremost in power, however, ranked the school of Cologne. The city was then a centre of the mystical movement of Germany. The creations of Meister Wilhelm (Hermann Wynrich) may be regarded as the most finished works in conception and execution of early German painting. About 1400 a new era broke over German art. Not Heaven but earth

claimed its interest. A naïve realism replaced the dreamy vision of soulful saints. The Gothic type gradually disappears. It is succeeded by a naturalistic tendency bent upon characteristic representation of the individual. The spirit of discovery and of invention arose in its power. Thus the beginning of the 15th century became again a period of experiment and of new technical processes. Especially influential in bringing about this change was the great altar of Ghent, which in 1432 made the names of the Flemish painters, Hubert and Jan van Eyck, famous for all time. A practically new technique—the use of oil mixtures—presented itself here, and soon all Europe was engaged in working out new problems of painting.

Stephan Lochener (d. 1452) in the beginning of his career painted a series of harmoniously beautiful works in the spirit of the early Cologne school, of which the best known is the altarpiece of the cathedral. Later Lochener loses himself in imitation of the Flemish masters, as do the later painters of Cologne.

Lucas Moser in Swabia and Pfennig in Nuremberg are the most important painters of the South. Their works form a strange contrast to those of the foregoing period in their short, heavy figures and in their genre-like use of the incidents and implements of daily life.

Flemish influence during the 15th century gradually becomes paramount, not only in technique, but also in the type of figure adopted, in costume, landscape, portraiture, composition, and color. Different local schools progress in the knowledge of perspective, anatomy, in the management of drapery, and in atmospheric unity. In Kolmar, Kaspar Isenmann (d. 1466) founded a workshop in which was trained the artist who was destined to give to the school of the Upper Rhine a position of leading power, Martin Schongauer (d. 1491). His influence on his time was far-reaching.

In Ulm, Bartholomäus Zeitblom (c. 1450-1517) took the leading position, through the exceptional restraint and simplicity of his compositions. In the local school of Augsburg the chief place is filled by Hans Holbein the Elder (1460-c. 1524). In his works it is possible to trace the progress made by German art in this period from narrow realism and exaggerated movement to an understanding of the harmony of form and color characteristic of the Renaissance.

Nuremberg continued during the 15th century to be a centre of artistic energy. Hans Pleydenwurff is the first name in a long list of local artists. Pleydenwurff had a talent of superior order and delicate artistic appreciation, but he died young, leaving his workshop to Michael Wolgemut, under whose name many of Pleydenwurff's paintings are known. To Wolgemut (1434-1519) art was a business. In his works, as well as in numberless other productions of the Nuremberg school, we can best see

the subject-matter to which the early artists of the 15th century devoted their attention. The subject of the Passion of Christ, and the sufferings of martyrs, become the theme of their art.

The sculptors of this time may be divided into two groups. In northern Germany the centre is again Cologne, whose masters are influenced in plastic, as in painting, by Flemish models. In southern Germany the centre is Nuremberg, where sculpture precedes painting in importance until the end of the century. Michael Wolgemut is the first artist we meet here, in whose busy workshop sculptors, as well as painters, were employed. Perfection of form and harmony of composition are sought. The individual and the momentary are changed into the typical and the enduring. Three artists stand out in prominence, all in Nuremberg; the one, a carver of wood; the second, a cutter of stone; the third, a founder of bronze—Veit Stoss, Adam Krafft, and Peter Vischer.

Outside of Nuremberg we find only the sculptors of Lower Franken, in and near Würzburg, of importance. The 'Master of the Creglinger Altar' and Tillmann Riemenschneider (1460-1531) are the two names worthy of especial note.

The representatives of the Swabian school of this period are Jörg Syrlin and Friedrich Herlen. In northern Germany the development of woodcarving culminated in the richly-decorated altar of Hans Brüggermann (1515), now in the cathedral of Schleswig.

In Tyrol we find a sculptor, who, although near to the Italian boundary, nevertheless shows himself a northerner in form and feeling. Michael Pacher (d. 1498) owes his refined taste and his monumental composition to his contact with Italy, his wealth of fanciful detail and his treatment of drapery to his native surroundings.

It was no mere chance that in painting, as in sculpture, Nuremberg produced the first great artist who united theory and practice to a noble whole. The city had been for generations the chief centre of artistic movement and interest. In Albrecht Dürer we find the full and complete expression of the spirit of German Humanism, which was ethical as well as æsthetic in its nature. His works are mirrors of universal personality. In him took place that transfiguration of art which stamps its creations with living truth and gives to them enduring value.

Albrecht Dürer (1471-1528) was the third among eighteen children. He entered the workshop of his father, a skillful goldsmith, to learn his trade, but was sent later (1486) as a pupil to some unknown painter in the workshop of Michael Wolgemut. Dürer's portrait by his own hand at 13 years in Vienna shows the early talent of the boy. In 1490 he started on the usual pilgrimage of young German artists to distant centres of art, and visited Kolmar, where he came under the influence of Schon-

gauer, then Augsburg, Basel, and Italy. In 1494 after his return to Nuremberg he was married to Agnes Fry. He enjoyed the protection and friendship of the learned young patrician, Willibald Pirkheimer, through whose influence he entered the circle of the humanists where his mind was stirred by contact with such men as Erasmus von Rotterdam and Reuchlin. In 1506 Dürer made a second journey to Italy, where he spent a year, devoting himself especially to Venice. In 1520-'21 he undertook a lengthy visit to the Netherlands. On the 6th of April 1528 Dürer died in Nuremberg, the scene of his life labors.

His genius belongs to the highest class. He far surpasses in range of imagination, in depth of feeling, in understanding of nature, and in artistic power of presentation any of his compatriots. His productiveness was especially great in the field of engraving. His wood cuts and engravings stand unsurpassed.

Among Dürer's numerous religious paintings: 'The Trinity' in Vienna, 'Christ on the Cross' in Dresden, must be especially mentioned, while the crowning masterpiece of his art is to be found in the 'Four Apostles' in Munich, a work unparalleled in the history of German painting for monumental greatness and truth to nature.

An artist of Dürer's genius necessarily had a powerful influence upon the further development of his country. His wood cuts and engravings carried the knowledge of his great spirit into the most distant provinces. The later painters of the Nuremberg school according to their own greater or less pronounced individuality followed in his footsteps. Among Dürer's own pupils his brother Hans Dürer (1490-1538) deserves mention, also Hans Schaüfelein (c. 1840-1540), Hans von Kulmbach (1475-1522). Among the younger generation of his followers Georg Penz (c. 1500-1550) and the two brothers, Hans Sebald Beham (1500-1550) and Barthel Beham (1502-1540) were, like Dürer himself, enthusiastic supporters of the Reformation.

In the district of the Upper Rhine a school of painters, whose chief representative is Matthias Grünewald, preserved an element of independence. Grünewald's (c. 1479-1525) importance lies in the artistic means which he employed to give his paintings life and beauty. He was, in contrast with his contemporaries, a colorist. Effects of light and harmony of color formed his ideal.

Grünewald's influence is seen most clearly in the works of Hans Baldung Grien (c. 1475-1545), who combines coloristic aims with a baroque imitation of Dürer's forms.

Albrecht Altdorfer (c. 1475-1538) is also a product of the art of Dürer and Grünewald, but a painter of decided individuality who developed in his landscapes an atmospheric quality which gives to them great charm.

To this period belongs Hans Burgkmair (1473-1531), who endeavored to transform the circumscribed natural-

ism of the 15th century into greater nobility of form through the use of Italian types. Burgkmair was followed by Christoph Amberger (c. 1500-1561) by Martin Schaffner (d. 1541) and Berhard Strigel (c. 1460-1528), who excelled especially as portraitists.

In Augsburg, the centre of riches and culture, was born Hans Holbein the younger (1497-1543), that painter, who, together with Dürer, stands in the foremost rank of Renaissance art. Holbein's first instruction was received from his father in his native city. Later he was occupied in Basel as well as in Augsburg. When the storm of fanaticism against art broke during the Reformation, Holbein turned his attention to England and in 1526 visited that country for the first time. In 1538 he became the court painter to Henry the VIII and in this position fell a victim to the pest in November 1543.

Holbein possessed a remarkable sharpness of eye for every detail of nature, a boldness of drawing comparable to that of Mantegna, an exquisitely fine sense of modeling, and a greatness of conception classical in its spirit. As a colorist he is unequalled in German art. Holbein's Madonna of the Bürgermeister Meyer now in Darmstadt is to German art that which the Sistine Madonna of Raphael is to Italian painting, the culmination of a long period of artistic evolution.

Long lists of portraits by the hand of Holbein vie with one another in excellence, none however surpassing that of the Ambassadors in London. To estimate correctly the greatness of Holbein's genius, a careful study must be made not only of his paintings, but also of his engravings and wood cuts. The deep earnestness of his nature and his fiery religious zeal speak from his illustrations of the Bible, his representations of daily life and above all in his celebrated series of the Dance of Death.

The remaining painters of this period were scarcely more than imitators, or clever artisans. In Saxony, however, a school of influence was founded by Lucas Cranach the elder (1472-1553), whose name became for a time almost as popular as those of the great artists of southern Germany. As a landscape painter and harmonious colorist, Cranach deserves a high rank, but he soon became affected in his types and sterile in his compositions, losing himself in countless soulless repetitions.

Upon the great period of Dürer and Holbein followed a weakening and lassitude of artistic power, which lasted nearly 200 years. The later 16th and the early 17th century were filled by poor productions in imitation of Italian art, later in imitation of Flemish models. The only real artist whom Germany produced at this time was Adam Elsheimer (1578-1620), who created a new form of landscape, in which the human figure became an integral part of the compositional whole.

In the 18th century there are likewise but few names

of especial note. Denner (1685-1749), a portraitist, depicted the human face with the exaggerated detail of a microscopic vision. Chodoviecki (1726-1801) paints the life of the burgher. Anton Graff (1736-1813) possesses in portraiture excellent technique. Architectural scenes, animal hunts, still life were copied from Flemish models. Academic barrenness paralyzed inner life.

Sculpture shared the general downfall. The Thirty Years War destroyed the seeds from which new life might have sprung. From the end of the 16th century until the last decade of the 17th foreign sculptors were almost exclusively employed. Superficial beauty and emptiness of form replace healthy naturalism. At the beginning of the 18th century single cities produce some good works of home talent. As the best of these is to be regarded the bronze statue of the great Kurfürst in Berlin by Andreas Schlüter (1664-1714), the foremost representative of German baroque. In southern Germany Georg Raphael Donner (1692-1741), in contrast with Schlüter, devotes himself to a study of the antique, striving after simplicity of composition and form, as is shown in his celebrated fountain in Vienna. A return to nature is sought by the Berlin sculptor Johann Gottfried Schadow (1764-1850), whose worthy followers are Christian Rauch (1777-1857) and Ernst Rietschel (1804-1861).

Winckelmann's History of Ancient Art in 1764 created a new artistic enthusiasm in the minds of Germany. His followers hoped for a new birth of art through contact with and appreciation of the art of Greece. When Goethe in theory and practice lent his influence to this teaching, the supremacy of antique ideals became settled. Raphael Mengs (1728-1779) adopted the principles propounded by Winkelmann as his guide and became the founder of German classicism. Although his perfectly formed figures possess no inner life, Mengs was in his own time looked upon as a new Raphael. Angelica Kauffmann (1741-1807) painted allegorical and historical scenes of merit as well as portraits of sentimental charm. Carstens (1754-1798) may be regarded as an artist who possessed not only the form but also much of the spirit of the classical models he followed. In Peter Cornelius (1783-1867) we greet a powerful artist of this period, burning with energy and ideality, his hand trained, his eye set on mighty deeds. The figures, however, which crowd his frescoes, have no root in the soil from which they spring. Of lesser talent but similar aims are Wilhelm von Kaulbach (1805-1874) and Julius Schnorr von Carolsfeld (1794-1872).

With the beginning of the 19th century a group of artists, preserving each his own individuality and technique, found their way again to the thoughts and hearts of the people. The principal names among these are Moriz von Schwind (1804-1871), Ludwig Richter (1803-1884) and Adolf Menzel (1815-1904). Schwind is the

pleasant narrator of German fairy tales, Richter the illustrator of the homely, hearty scenes of everyday life, while Menzel is the enduring naturalist, historian of national aims and deeds, a painter and especially a draughtsman of great power. Anselm Feuerbach (1829-1880) sought to unite romantic ideals with classic form. To Hans Makart (1840-1884), a brilliant colorist and pupil of Piloty's, the world appeared as a theatrical scene of bright draperies and gay personages. Landscape painting rose to a high degree of excellence through the painters Friedrich Preller (1804-1878), Karl F. Lessing (1808-1880), and the brothers Andreas and Oswald Achenbach.

With these artists of note are associated in the second half of the century the painters of religious scenes and of genre, Knaus, Vautier, Defregger, Edouard von Gebhard, Gabriel Max, Piglheim, and Fritz von Uhde.

At the close of the 19th century three names stand out in prominence—Lenbach, Thoma, and Böcklin. Franz von Lenbach (1836-1905) is the leader among portraitists and a colorist of power. Hans Thoma (b. 1839) depicts in simple truthfulness the German peasant and repeats in poetical landscapes the scenes of his native land. In Arnold Böcklin (1827-1901) the naturalistic pantheism of the Greeks is born again. He gives us a new world of satyrs, fauns, nymphs, and nereids. He experiments in new technical methods and invents new tones of vivid color. As a landscape painter he possesses the charm of composer of melodious music.

In this morning of the 20th century, individual artists are following individual paths. Adolf Hildebrand (b. 1847) in sculpture possesses in his best works simple greatness and pure beauty. Volkmann follows his lead. In contrast to Hildebrand is the sculptor Reinhold Begas (b. 1831), who relies for his effect upon a modern baroque splendor. In painting and in sculpture Max Klinger (b. 1857) stands forth as an artist of power, while a large group of painters, prominent among whom are Kalckreuth and Max Liebermann, devote themselves to the development of the aims of the French impressionist school.

GERMAN PHILOSOPHY AND SCIENCE: The most valuable contribution to knowledge of the early times was the historiography done in the German cloisters. Their 'annals' were faithful work and Einhardt's *Life of Charlemagne* (written 820) is a noble piece of history writing. But the scholarly thought was still essentially imitative. When in the 9th century the Benedictine Rhabanus Maurus in the cloisters of Fulda wrote his encyclopedia *De Universo*, in 20 books, setting forth the status of German knowledge in the time of Charlemagne, it was on the whole a repetition of that which Isidor of Sevilla had brought together in the 7th century. All thought about nature was controlled by the

ancients. And when in the 11th century a new European movement of thought was growing, the great scholastic effort to harmonize belief and reason, France, Italy, and England gave the signal. Yet Germans as, for instance, Hugo, Count of Blankenburg, took an important part, and Albert von Bollstädt, called Albertus Magnus (1193-1280), was one of the deepest and most brilliant scholastic thinkers, whose knowledge of natural science, too, was far superior to his age. Theologians and philosophers of repute, like Thomas von Strassburg, followed in the 14th century, and certainly no thinker of the 15th century equalled the cardinal Nicolas von Cusa (1401-1461), who combined scholasticism and Platonism, mathematics and theology. In the meantime Germany had founded its famous seats of higher learning, the universities, which have been always at the same time schools for the professional training of clergymen, teachers, doctors and lawyers and centres of productive scholarship. Through the 13th century the university of Paris was the point of crystallization for scholasticism; in 1348 the first German university was founded in Prague, soon after that the university of Vienna, and Western Germany followed immediately with Heidelberg (1385) and Cologne (1388). The political disturbances in Bohemia brought about a secession in Prague, and its emigrating scholars founded the university of Leipzig (1409). These new centres of scholarly influence increased the independence of German scholasticism of the dogmas of Paris, and in the declining period of mediæval thought the German systems of nominalistic philosophy played an important rôle.

The opposition to the hairsplitting rationalism of scholastic thought came from two movements which better expressed the German instincts: mysticism (q.v.) and humanism. Mystical speculation became influential from the beginning of the 14th century; in an immediate personal unity with God there was sought a deeper knowledge than that of church and university. The mystical study of nature was most strongly influenced by the physician Paracelsus (1493-1541). His aim was a fundamental reform of medicine, which had still the stamp of Galen and Avicenna. His numerous writings influenced, through all Europe, medicine, alchemy, and theosophy. The last great mystic was Jacob Boehme (1575-1624), whose speculations concerning God's relation to the world and its evils became influential through the following centuries.

Far more systematic and scholarly was the opposition which arose against scholasticism from the humanistic side. The European renaissance created the historical æsthetic interest in the literary treasures of classical antiquity, it opened the eyes to nature, and it liberated from the mediæval onesidedness of christianized Aristotelianism. The time thus demanded philology, natural science, and independent philosophy. The great philo-

logical movement was carried by Germans like Johann Wessel, Rudolph Agricola, Johann Reuchlin (1455-1521), who inaugurated the study of the Hebrew language in Western Europe; Erasmus of Rotterdam (1457-1537), the most eminent scholar and the most witty writer of his time, who published the first edition of the Greek New Testament; and above all the 'teacher of Germany,' Philipp Melanchthon (1497-1560) (q.v.). The return to nature and the striving for scientific knowledge is expressed in great scholars like the mathematicians and astronomers Nicholas von Cusa, Georg Peurbach, Regiomontanus (1436-1476), famous for his *Ephemerides ab Anno;* Martin Stöffler, and epoch-making Copernicus (1472-1543), whose discovery that the planets moved around the sun was worked out in *De Orbium Celestium Revolutionibus.* The movement culminated in Johann Keppler (1571-1630), who discovered that the planetary orbits are elliptic and that the squares of the periods of revolution of any two planets are to each other as the cubes of their mean distances from the sun.

Humanism thus brought to Germany ample results in the fields of philology and natural science, but seemed without such results in that field in which the other countries gained most by the renaissance: philosophy. The German philosophical humanistic reaction against mediævalism and scholasticism was impeded by the religious movement which absorbed Germany's metaphysical energies—Protestantism. In the days of the new awaking, when Italy and France and Holland and England produced great philosophical systems, Protestantism necessarily inhibited the metaphysical movement in Germany. The new spirit had thus to come from foreign lands. The French language and literature and philosophy entered at first the courts of Germany and soon after its universities; the humanistic neo-classical interests were replaced by the more 'modern' efforts which had been developing in the neighboring country since the days of Descartes. The universial thinker who stands at the threshold of a new and better time is Leibnitz.

Gottfried Wilhelm von Leibnitz (1646-1716), a man of the great world, brought German thought in contact with the advanced scientific spirit of France, Holland, and England. Through his influence the Berlin Academy was founded in 1700 with the aim to create a place for the real advancement of knowledge at a time when the universities felt, on the whole, satisfied with handing down the scholarly traditions. He created the most elegant instrument of natural science; the differential calculus, which he published (1684). But still more important was his metaphysical system. It shared with Descartes and Spinoza the rationalistic belief in the power of transcending experience through reason, but Descartes' sharp separation of mind and body and Spinoza's monism were left behind by Leibnitz's 'monadology.' His monads,

held together by pre-established harmony, represent a continuous series of simple substances which are without windows, each containing the whole world as perceptions, but each apperceiving only a varying part of them. His system fulfills in an original way the purpose of every great philosophy: to justify and to harmonize both the causal, mechanical, and the teleological idealistic knowledge of the time. And thus Germany had finally, as the last of the European nations, a real philosopher who was to introduce the enlightenment of the 18th century.

While Leibnitz brought the modern interests to the German courts and academies, the universities, too, reflected the progressive time. Halle, founded in 1694, and Göttingen, founded in 1737, became the new centres of an activity which had no sympathy with the doctrines of authority, either the theological ones of the church or the classicistic ones of the humanists. An independent free thought, working with mathematics and logic and empirical observation, was the demand of the time in every field. The jurist Thomasius (1655-1728) became the leader of the academic movement of protest against all narrowness and prejudice, fighting alike against the mediæval methods of legal and equivocal prosecution, against the superstitions of orthodox theology, and against the artificiality of classical learning. He was the first to emancipate German university instruction from the traditional Latin and to publish a literary critical magazine in the German language. The great pietistic anticlerical movement which Spener (1635-1705) started, influenced by English puritanism, was continued in Halle by Francke (1663-1727), to whom true Christianity was not an object of science but a living duty; and yet even the insistence on the Bible as the only true source of religion meant here, as two centuries before in Luther, in first line not a binding of the free intellect, but a liberalizing and modernizing opposition against the orthodox spirit of the past. The full development of theological criticism in Halle belongs rather to the influence of Semler (1725-1791), whose historical interpretations of the Bible open the way for the new rationalistic theology.

The most influential separation from church authority, however, on all fields of human thought came through Halle's fertile philosopher, Christian Wolff (1679-1754). His system was no great original construction—it was essentially Leibnitzian philosophy—but it gained its new strength and power by being really a system. Dogmatic rationalism herein reached its most self-conscious expression and Wolff's didactic treatment of ontology, cosmology, psychology, theology, ethics, economics, and politics soon penetrated the whole Protestant scholarship of Germany. Theology and metaphysics, morality and jurisprudence had to become 'natural' and 'rational'; the ideals of mathematical knowledge and social happiness deter-

mined the whole period. The Leibnitz-Wolffian movement was not without opponents like Crusius and Rüdiger, and yet the adherents carried the day. Among Wolff's pupils, besides interesting philosophers like Bilfinger and Lambert, Baumgarten (1714-1762) must be mentioned as the founder of German 'æsthetics,' a name which he invented. The scholarly rationalistic philosophy yielded quickly to its natural tendency to subserve the practical purposes of human virtue and happiness, to be reached by the emancipation of the individual from every authority but its own reason, and with this practical aim came the tendency to popularization. It was a movement to which Frederick the Great lent himself from the Prussian throne, and authors like Moses Mendelssohn and Reimarus, Nicolai and Engel, Tetens and Moritz spread it throughout Germany. Here also is the place for the important scholarly writings of the poet Lessing (1729-1781), who stimulated theoretical æsthetics as well as philosophy of religion and philosophy of history.

While thus the new philosophical and theological spirit of the 18th century radiated from Halle, it was the university of Göttingen in which the new scientific and philological impulses started, till finally the light came from Königsberg. In Göttingen taught the next to Linnaeus most eminent biologist of the time, Albrecht van Haller (1708-1777), famous for his botanical books, but still more influential by his medical studies. He introduced the physiological experiment, and his demonstrations of what he called sensibility and irritability of nerves and muscles, became the starting point for biological theories which controlled the medical discussions of Europe down to the time of cellular pathology. Among those who took part in these physiological, pathological, and therapeutical controversies of the 18th century Frank, Weikard, Röschlaub, Pfaff, and others belong to Germany; and especially the group of those who defended that branch of Haller's system which had found its development in France under the name of vitalism: Blumenbach, Reil, and Hufeland. Blumenbach (1752-1840), who interprets the organic world by his 'nisus formativus,' became the founder of anthropology; the doctrine of the five human races is his. He was also the first to lecture on comparative anatomy. Reil considers life as a galvanic process, and with Hufeland the doctrine of animalism becomes practical medicine. Side branches of this vitalistic movement are mesmerism and homœopathy, whose founders, Mesmer (1734-1815) and Hahnemann (1755-1843), are German physicians.

While biological studies flourished in Göttingen through Haller and Blumenbach, mathematical and physical, historical, juristic, and philological scholarship also found there the most brilliant representation. Lichtenberg (1744-1799) had there his model laboratory for physics and his theories of electricity became victorious.

Tobias Mayer (1723-1762) worked out there his famous catalogue of zodiacal stars and Kaestner (1719-1800) attracted the mathematicians. All three stand as foremost representatives of the inorganic sciences of the time; yet Euler (1707-1783), whom Frederick the Great called to Berlin, was perhaps more original in his numerous works dealing with mechanics and dioptrics, integral calculus and astronomy. Chemistry which began to demolish the old phlogiston theory was largely enriched by the comprehensive analyses of Scheele (1742-1786), by Klaproth and others, and Richter (1762-1807) became the founder of chemical stoichiometry.

The classical philology of the 18th century also took, in Germany, a new turn. It was the time of the great literary movement in which every mind was directed toward the beauty of art. The new aim for the student of antiquity was to join the interest in classical fine arts with the interest in the writings and to approach the literature of antiquity with the attitude of æsthetic appreciation.

While thus the spirit of enlightenment in philosophy and natural sciences, in jurisprudence and theology, and the æsthetic spirit in literature, history, and philology gave interest and value to the intellectual life of Germany, the greatest emanation of the German genius had prepared itself. In the year 1781 appeared the first of the three great critiques of Immanuel Kant (1724-1804). Kant's critique of pure reason, critique of practical reason and critique of judgment, represent the most essential progress of human thought since Plato and Aristotle. The preceding rationalism which sought knowledge of metaphysical reality through reason, and the preceding empiricism which sought knowledge from the impressions on the senses, were equally superseded by Kant's 'criticism,' which proves that knowledge does not mean a reproduction of an independent reality, but a reconstruction of objective data by the subjective categories of perception and understanding. Knowledge is thus not concerned with a metaphysical reality; but we belong to the world of reality as free subjects of will who are determined not by the causality of phenomena, but by duties. This gigantic reorganization of human knowledge and morality inspired the leaders of German culture; in Schiller it came into live contact with the great literary movement of Germany.

In the philosophical discussion of Kantian philosophy Jacobi, Beck, Maimon, Reinhold, Fries, represent most different attitudes, yet none of them suggests real progress. But Kant's system demanded further development; the subjective factor of his system was not really connected with the objective factor. The genius of Fichte (1762-1814) created a system whose ethical idealism made the object itself dependent upon the will-act of the subject, while Herbart (1776-1841) moved in the op-

posite direction, developing out of Kant's objective factor a realistic system which gave impulses to modern psychology. Directly from Kant, too, is derived Schopenhauer's (1788-1860) voluntaristic system of pessimism, which combines Kant's doctrine of the categories with Platonism and Buddhism. Schleiermacher (1768-1834) finally seeks to harmonize the ideal and the real factor in the interest of ethics and religion. It was Fichte's system which showed the direction for the further movement. The life of nature had been neglected in Kant and Fichte; as soon as it becomes a factor in philosophic thought, ethical idealism turns into the objective idealism of Schelling (1775-1854), and ultimately into the absolute idealism of Hegel (1770-1831), which understands nature and mind as the logically necessary expression of the Absolute. At every stage idealism exercised influence on the intellectual life of the time. From Fichte started the ethical regeneration of Prussia, expressed in the foundation of the university of Berlin (1810), and the romantic movement of Schlegel and Novalis. Schelling, on the other hand, influenced most deeply the naturalists, men like Oken, Oersted, Carus, Ness von Esenbeck, and many others who brought natural science itself under the categories of Schelling's system of identity, but philosophers like Krause and Solger also followed him. The strongest philosophical influence, however, resulted from the Hegelian system which, at about 1830, entirely controlled the academic philosophy of Prussia. But the triumph of Hegelianism meant an overtension of purely speculative thought, the maximum distance of theoretical and metaphysical construction from the facts of observation. This neglect of experience demanded a necessary reaction against speculation; the breakdown of metaphysical onesidedness was disastrous. In the fourth decade of the 19th century the defeat of philosophy seemed complete and it meant the triumph of natural science as against metaphysics, of analysis as against synthesis, of realism and materialism as against idealism, of technique as against art, of specialization as against generalization. This naturalistic reaction filled the larger part of the 19th century in all civilized countries and brought to them the manifold discoveries and inventions which seem most characteristic of the time. Only at the end of the 19th century does the pendulum seem to begin again its backward swing with a new awaking of the idealistic spirit and deeper philosophical interests as reaction against the philosophical superficiality and incoherency of mere specialistic science.

In every new phase of this 19th century movement German scholars have taken the leadership. The deep philosophical longing of the German soul had created the unique movement which led from Kant to Hegel, but when the opposite tendency of the newer time demanded

the patient work of the specialist, it was the world-known German thoroughness which won the laurels for the German laboratory experiment and naturalistic research and historical investigation.

Of course this specializing work had not waited for the downfall of philosophy; it took its rise in the work which we traced through the period of enlightenment in the 18th century. And further, the emphasis on specialization does not mean that the scientific life of Germany lacks in the 19th century great central figures, scholars with broad synthetic energy; the geographer Alexander von Humboldt, the physicist Helmholtz, the pathologist Virchow, the historians Ranke and Mommsen, are certainly not specialists in the narrow sense of the word. A short survey of the different fields indicates the abundance of brilliant thinkers who were grouped about such leaders. We may begin with mathematics and the inorganic natural sciences, then turn to the organic sciences and medicine, then to the historical and philological, economical and juristic, finally to the theological and philosophical fields.

For mathematics the first place belongs to Gauss (1777-1855) and after him the chief advance came through Jacobi, Dirichlet, Riemann, Kronecker, Weierstrass and others; yet the mathematical achievements were always blending with the works of physicists and astronomers—as not a small part of the mathematical progress belongs to naturalists like Kirchhoff, Helmholtz, Encke, Clausius, etc.

Gauss gave the strongest theoretical impulse also to astronomy, while Bessel (1784-1846) may be considered the founder of the practical astronomy of the century. Most influential for the theory were Hansen and Encke and their followers, Bruhns, Argelander, Brünnow, Auwers, etc. Here belongs also as a special triumph of German thought, the discovery of spectral analysis by Kirchhoff and Bunsen, applied by Zöllner and others.

In physics the turning point of the century lies at its middle when Helmholtz (1821-1894) and independently R. Mayer (1841-1878) formulated the law of the conservation of energy. In the first half of the century the best work in physics was done outside of Germany; among the Germans excelled Ohm (1787-1854) with his fundamental theories of galvanism; the brothers Weber, Poggendorff, Lenz, belong to the same period. The influence of Helmholz is felt not only in the theory of energy, but in the whole field of mechanics, optics, and acoustics, besides physiology and psychology. The next and last climax is reached by Hertz through his study of the propagation of electric waves. Important, too, are the thermodynamics of Clausius, the electrolytic work of Hittorf, and more recently the discoveries of Röntgen concerning cathode rays.

In chemistry the decisive step was the foundation of

a chemical university laboratory in Giessen by Justus Liebig (1803-1873), the greatest chemist of his time, who revolutionized organic chemistry and whose researches became invaluable for agriculture, pharmacy, the preparation of food, etc. Out of his school came influential chemists of all nationalities; in Germany itself especially, Kekule, Hofmann, Fehling, Kopp, Bayer, V. Meyer. Other centres of chemical ideas were the laboratories of Wöhler in Göttingen, of Bunsen in Heidelberg, of Mitscherlich and Rose in Berlin. The theory of atomistic combination was furthered by the antagonists Kekule and Kolbe, stereochemistry by Wislicenus and von Meyer, inorganic analysis by Wöhler, Winkler, Kirchhoff, and Bunsen. The first organic synthesis is the famous work of Wöhler in 1829. It opened the long series of synthetic successes of which not a few became technically important, as those of Fettig, Gräbe, Hofmann, Fischer. Practical gain also to pharmacy came directly from German chemistry; chlorohydrate and chloroform, salicyl and antipyrin, etc., are products of German laboratories. The incomparable position of German chemical industry is the immediate outcome of the wonderful development of chemical science in German universities and technological institutes.

The independent growth of physical chemistry prepared by Kopp, Bunsen, Wiedemann, became most significant in recent times through Ostwald, Van't Hoff, Nernst, etc. Mineralogy and crystallography connects its development in Germany in first line with the name of C. S. Weiss in Berlin, Neumann in Königsberg, Hessel in Marburg, Rose in Berlin, von Rath in Bonn, Zirkel in Leipzig, etc.

Geology became a science in Germany through A. G. Werner, in Freiberg, at the beginning of the century, and L. v. Buch developed the doctrine of the slow upheaval of continents; his geological map of Germany appeared in 1824. But greater was their pupil, Alexander von Humboldt (1769-1859), the most comprehensive German naturalist of his time. His studies in South and Central America and in Asia, his incomparable richness of observation in all fields of descriptive science, his unifying apperception of nature, as expressed in his *Kosmos,* make him the most imposing and most sympathetic figure in the German science of the first half of the last century.

Inasmuch as Humboldt's geography was essentially physical, it seemed opposed to the historical-geographical interest. A synthesis of both tendencies characterizes the work of Carl Ritter (1779-1859), whom his time considered the founder of scientific geography. His contributions to theoretical geography found a brilliant continuation through Peschel, Kiepert, Gerland, Ratzel, and others. In the meantime, practical geography was stim-

ulated by Richthofen, Peschuel-Lösche, etc. Well known are the maps of Petermann, Perthes, etc.

Geography may connect the inorganic with the organic world. To begin with botany, the first decades of the last century belonged to plant anatomy; the highest point was reached by H. v. Mohl. Then came, about 1840, the turn to the genetic study, and the development of plant histology. The epoch-making discoveries of Schleiden (1804-1881) and of Nägeli showed the way. The morphologic work, partly with histological, partly with phylogenetic interest, was continued by Schwann, Hofmeister, Pringsheim, DeBary, Strasburger, Solms, etc. The fundaments of plant physiology were laid by Julius Sachs, whose *Experimental Physiology of Plants* appeared 1865. Pfeffer, Klebs, Stahl, etc., followed.

In zoölogy the century began with systematic interests, but turned soon to morphological ones and came on this path to the brilliant achievements connected with the names of Köllicker and Siebold, Ehrenberg and Max Schultze, Leydig, Leuckert, and Hertwig. The leader in comparative anatomy, which started in Germany with Meckel, the 'German Cuvier,' was Gegenbaur; the prophet of Darwinism became Hæckel, and the most influential critics of Darwinism, Wagner and Weismann.

The progress of human anatomy links itself partly with the same names which became influential in zoölogy; at the middle of the century the anatomists Henle, Hyrtl, Baer, and Köllicker stand as the acknowledged leaders. His, Hertwig, Roux, and Waldeyer represent the later decades. Yet, it is characteristic for the German mind, that its most brilliant achievements belonged to physiology rather than to anatomy. No field, indeed, has greater names than physiology, with Joh. v. Müller and Helmholtz. Rudolphi and Burdach, whose large physiology appeared 1832, made physiology at home in Germany, and soon came the master, Johannes v. Müller (1801-1858). His influence—it is said that he wrote 16,000 printed pages—was deeply felt throughout physiology, embryology, anatomy, and zoölogy; most popular is, perhaps, his doctrine of the specific energy of the senses. Among his many important pupils none was greater than H. v. Helmholtz (1821-1894), whose invention of the ophthalmoscope (1851) created the new ophthalmology. His physiological optics and his book on tone sensations are still authoritative today. Dubois-Reymond's investigations of electrophysiological phenomena, Ludwig's analysis of the functions of the heart opened new ways also, and so did Voit, Pettenkofer, Hering, Brücke, Pflüger, etc., in various directions.

In the development of pathology the central figure is Rudolf Virchow (1821-1902), whose cellular pathology revolutionized the theory of disease and led it to the heights of modern histology. His pupils, Cohnheim and Recklinghausen, continued his proof that the organic

laws working in disease are identical with those of the normal organism. A new movement came in with bacteriology; the discovery of the tubercle bacillus (1882) through R. Koch and his investigations of anthrax, turned his attention from the diseased cell to the microscopical causes of the diseases. From bacteriology pathology finally turned to chemistry, studying the substances produced by the diseased tissues. This led to the theory of antitoxins and to Behring's discovery of the antitoxin treatment of diphtheria. Practical medicine was in the meantime led by men like Frerichs and Erb, Langenbeck and Billroth, Graefe and Griesinger.

In the world of mental sciences it is philology whose specialistic ramification in the 19th century is similar to the work of the naturalists. The classical philologians led the way, and the grammatical scholar Hermann deepened the linguistic interest in the classical authors; his opponents, Boeck, Welcker, O. Müller, and others stood for a wider view of F. A. Wolf, taking philology in its fullest meaning. Zeller, Niebuhr, Droysen, Mommsen, Curtius gave new life to the thought and politics of the old nations, and Lachmann, Haupt, Ritschl and others interpreted their authors.

Germanic philology is entirely a product of the 19th century. The romanticists, Schlegel and Tieck, stimulated interest in it, but it became a real branch of scholarship through Lachmann, Benecke, and especially the brothers Jacob Grimm (1785-1863) and Wilhelm Grimm (1786-1859), whose studies in the history of the German language and literature became of paramount importance. As to other languages German scholarship has contributed much to Romanic, English, Slavic, but most of all to Oriental philology in the widest sense of the word, and through Bopp, Pott, Benfey, W. v. Humboldt, Schleicher, etc., is the comparative science of language essentially a German creation.

History, too, took the stamp of the specializing scholarship of the century. An overwhelming mass of material has been gathered by the research of the German historical schools. Typical are the *Monumenta Germaniæ historica*. But the pride of this field of German scholarship is the noble line of great historical writers. Niebuhr (1776-1831) gave to the world a perfect reconstruction of early Roman history, and Mommsen (1817-1903) equally eminent as historian, jurist, and philologist, gave in his Roman history the German masterpiece of classical history writing. Yet the greatest figure of this group was Leopold Ranke (1795-1886), whose works deal with the popes, with Prussia, England, France, especially in the 16th and 17th centuries, and in the last years of his life with world history; they are famous alike for their style and composition, for their richness of material, and for their objective presentation. Schlosser and Gervinus went their own way; Sybel and

Waitz, Giesebrecht and Treitschke, however, were deeply under Ranke's influence.

The economic life of the social community was seen at the beginning of the century through the eyes of France and England. The abstract theory of economy with its individualistic tendency controlled the first decades; of this the work of Rau is typical. With the year 1840 begins the growing reaction. The historical relativistic view is developed by Roscher, Kries, and others, and List, in his *National System*, Rodbertus, in his *Social Letters*, Marx, in his *Kapital*, led the attack of collectivism agains the abstract individualistic theory. Brentano, Knapp, and Schmoller turned the attention to the objective history of economic conditions.

The legal life of the community and the theory of law was the object of not less intense discussion. Among the leaders of the century Savigny, Windscheid, and Jehring may be mentioned for Roman Law, Eichhorn and Grimm for German Law, Mohl and Bluntschli for State Law, Feuerbach and Mittermaier for Criminal Law, Thibaut and Dernberg for Private Law, etc.

In the field of religion the naturalistic tendency of this post-idealistic period demanded, first of all, historical criticism, and yet positive theology was not idle. In the study of the Old Testament most fundamental research work was done by Hengstenberg, Delitzsch, and Hofmann; in the study of the New Testament by F. C. Baur, the founder of the school of Tübingen, D. F. Strauss, and in sharp contrast to them, Ritschl and Weizsäcker; in the study of church history by Planck, Neander, Ritschl, and Harnack; in the study of Systematic Theology by Schleiermacher, Rothe, Lipsius, Nitzsch, Ritschl.

And finally, philosophy. The period which we have just characterized by the abundance of its specializing work began with the downfall of Hegelianism. The age became indifferent to real philosophy and substituted either an uncritical materialism with Büchner, Vogt, or the history of philosophy which naturally became the domain of Hegelians like Erdmann, Kuno Fischer, etc., or developed a specialistic study of empirical psychology. In the latter field Germany founded, through Fechner and Wundt, the new science of experimental psychology. Mention must also be made of the strongly individualistic system of Friedrich Nietzsche (1844-1900) with its brilliant affirmation of life, which was finally carried by its author to a sort of ethical nihilism. In spite of its evident one-sidedness it has had considerable effect in counteracting the paralyzing effect of Schopenhauer in Germany, and has greatly stimulated and influenced the younger generation of thinkers in France, Italy and Scandinavia. In the last two decades of the century new interest in real philosophy has set in, partly in the midst of the special sciences, as mathematics, physics, history, etc., where a disappointment in mere fact-gathering has everywhere

led to the deeper problems of principle, partly in pure philosophy. This new idealistic movement has grown rapidly; logical, ethical, metaphysical, æsthetical discussions come again more and more to the foreground, welcomed by the empirical sciences which held them in contempt for half a century. And thus it can be said that with the beginning of the 20th century the anti-idealistic specialistic movement, which began in the third decade of the last century, has come to an end and a new synthetic idealistic tendency is appearing in Germany to-day.

GER'MAN SIL'VER [named from its manufacture first in Germany, at Hildburghausen]: alloy of copper, zinc, and nickel. It is variable in composition according to the requirements of the manufacture, but may be stated for general purposes, to consist of copper 50.0, zinc 30.0, nickel 20.0. This composition is very malleable, susceptible of high polish, and nearly as white as silver. This is used to imitate silver in articles which, being rolled and stamped, consequently require considerable malleability. By taking 55 parts of copper, 24.4 of zinc, and 20.6 of nickel, a beautiful alloy is obtained, scarcely inferior in beauty to silver itself. For wire-drawing and very thin rolling, a tougher alloy is formed of copper, 60 parts; zinc, 25 parts; nickel, 20 parts; and for castings the following proportions are used—copper, 60 parts; zinc and copper, each 20 parts. Many other formulæ are in use arising from difference of opinion among manufacturers as to the best proportions for their respective operations. Usually, however, the aim is to obtain a silvery whiteness and the largest proportion of malleability.—This alloy must not be confounded with other white alloys, such as Albata, Britannia metal, and nickel-silver, which are used as substitutes for the true German-silver. Albata is composed of copper, zinc, nickel, and a little lead; Britannia metal, of copper, zinc, tin, antimony, and sometimes bismuth; and nickel-silver, of copper 60.0, nickel 22.2, zinc 17.8. This last differs from German-silver only in its proportions; it has the color of highly polished silver, and is very hard. The color of German-silver being so near that of the precious metal, it is particularly well adapted for plating, either by the old process of rolling with silver, or in the newer and now usual process of electroplating: the advantages are that a thinner deposit of silver can be used, and the articles are made not liable, as with the old process of plating on copper, to show the reddish hue as soon as the silver begins to wear off.

GERMAN SOUTHWEST AFRICA: a German protectorate in West Africa, extending along the coast from Cape Frio to Walfisch bay, and inland to long. 20° e. It has an area of 322,450 sq. m.; pop. about 200,000. The seat of government is at Great Windhoek, which lies 170 m. e. of Walfisch bay. The country apparently has large deposits of copper and is rich in agricultural resources. In 1897 Germany began to build a railroad

from the coast to the interior, and on 1893, Feb. 13, appropriated $200,000 for its continuation. In 1902 the Europeans numbered 4,647, of whom 2,595 were Germans.

GER'MAN THEOL'OGY: collective name for various systems of theology in Germany since the Reformation.—I. The Reformation proclaimed justification by faith in Christ, instead of salvation by obedience to the Church. This led to the avowal that the rule of faith is found in the Scriptures, of which the central doctrine, giving them unity and life, is salvation for all men through faith in Christ. The views of the German reformers concerning the doctrines taught in the Scriptures are set forth by Luther in his catechisms and the Schmalkald articles, and by Melanchthon in the Augsburg Confession.—II. As the conflict with the adversaries of the Reformation advanced, Prot. teachers wrought to develop the external defenses of Christianity and to perfect its doctrinal statements. But thus engrossed they unhappily abated somewhat the energy of their spiritual life. Consequently, as formal orthodoxy advanced vital Christianity declined.—III. This tendency was arrested at the opening of the 17th c., by the declining spiritual life being wonderfully revived through the instrumentality, at first, of *True Christianity*, a book written (1605) by John Arndt, with the aim of awakening men to fervent piety and pure living. It produced a powerful effect and attained a circulation scarcely equalled by any other uninspired religious book. Spener, A. H. Francke, and Paul Gerhard, aided the movement, and, by establishing meetings, which they called 'Colleges of Piety,' gave it the name (see PIETISM) by which it is still known. Bengel, Zinzendorf, and others were active also in the movement, whose power was felt for a century and a half.—IV. But this movement, beneficent as it was, by devoting itself altogether to Christian feeling and activity, lost first the disposition, and then the ability to teach and defend Christian doctrine. Thus the Pietists left the way open for those who finally (see RATIONALISM) made human philosophizing the basis and standard of religious things. Many teachers and writers were engaged in spreading rationalistic views: Wolf (abt. 1750), though earnestly professing faith in the word of God, is called, because of the tendency of his philosophical opinions, 'the father of German rationalism;' Semler (died 1791) received the Scriptures as of divine authority only on ethical subjects; Lessing (died 1781) affirmed that the Scriptures are textbooks which perhaps may be set aside when the world is prepared for the new everlasting gospel; Paulus (died 1851, at the age of 90) has been called 'an unmitigated rationalist—a man who sat down to examine the Bible, convinced that everything in it represented as supernatural is either simply natural or fabulous; and that true criticism consists in proving that such is the fact.' His views were superseded, even before his death, by the mythical theory (see STRAUSS), which many for a time extolled as a great advance in the rational treatment of Scripture and Christianity.—V.

While philosophical speculation was striving thus to establish itself as the foundation of theological truth, it also was developing into the broad assertion that 'God' is but the name for the one universal existence; that God, nature, man, angels, devils, matter, spirit, good, evil, holiness, and sin, all are parts of one immeasurable whole of being (see PANTHEISM). This was directly in the line of the Hindu philosophy of 2,000 years before Christ. The Greeks also had held similar views, in various schools and at different times, both before and after the Christian era. And they, in turn, had been followed by many among the schoolmen of the middle ages (see MYSTICISM). The prevalence of pantheism in Germany is due chiefly to Spinoza (q.v.), a Jew (b.1634). His philosophy, Leibnitz said, was 'Cartesianism run wild.' The philosophy of Fichte (q.v.) (d. 1814) is described by competent critics as pantheistic; yet he earnestly protested his faith in a personal God. Schelling (q.v.) (d. 1854) was a disciple of Fichte, but professed to advance beyond him. His writings, also, are affirmed to be intensely pantheistic; yet in his maturer years he asserted his faith in a personal God, and even in the doctrines of the Augsburg Confession. Hegel (q.v.) (d. 1831) was a follower of Schelling, but went beyond him. He taught that we can know God purely and completely because we are a part of God. Rosenkrantz (b. 1805), following Hegel, and representing the extreme of pantheism, asserts that sin is one form of the activity of God; that the wicked and Satan are self-manifestations of God; and that, if any recoil from such language it is because they do not recognize the fact that without evil, there can be no good.—VI. The Reformation gave a powerful impetus to biblical study, and to a critical examination of many questions relating to the text, style, date, contents and authorship of the various books. During the last 100 years, questions in this department have been multiplied, extended in range, and discussed with intensified boldness and zeal. Eichhorn, in his work (1780) embracing the various elements of the study in an organic method, gave it the name (see HIGHER CRITICISM) which has since come into general use. He has been followed by Michaelis, De Wette, Bleek, Ewald, Ranke, Hengstenberg, Hävernick, Kiel, Knobel, Reuss, Kuenen, and Wellhausen By these and other writers, the Pentateuch has been subjected to elaborate scrutiny and protracted debate, in which some of them have ably defended its integrity and authority as the genuine work of Moses; while others, after what is called a profound analysis of style, diction, and history, assert it to be of composite character and the work, at least in its present state, of men who lived centuries after the death of Moses. On this negative side, the last three writers mentioned above maintain the most advanced positions, and against their theories the defense of Moses has been of late mainly directed.—VII. While rationalism, pantheism, and destructive criticism were uniting their efforts to overwhelm Christianity, its truth was maintained in the lives of

genuine disciples and in writings which combined intellectual power with faith. Klopstock's *Messiah*, the publication of which was commenced in 1748, was circulated throughout Germany, among all classes of people, and drew thousands to faith in Christ. Hamann, converted from a dissolute life, acquired by his writings great influence over men in the highest ranks. Herder (q.v.), by his *Spirit of Hebrew Poetry*, and by his writings on the New Testament, exhibited both the beauty and the inspiration of the Scriptures. Schleiermacher (q.v.) cherished from his youth an ardent love for Christ, which controlled and exalted the sometimes startling tendencies of his philosophic system. His *Discourses* (1799) 'marked at once the opening of a new century and of a new era in religion.' Among the multitude converted by them was a young Jew who, at his baptism, took the name Neander ('new man'), and was made a prof. at Berlin. Great crowds came to his lectures from all parts of Germany and from distant lands. Multitudes of the preachers of Germany were enlightened by him. Tholuck (q.v.), converted from unbelief by the agency of Schleiermacher and Neander, became, in his turn, the winner of thousands of young men in Christ. Hengstenberg (q.v.) also, about the same time, was conspicuous among those who defended the Scriptures against critical assault.—VIII. At the present day, the discussions in German theology continue along the lines above indicated; but with noticeable tendency to eclecticism, and with some modification from the former bitterness of assault on Christianity.

GER'MAN TIN'DER: see AMADOU.

GERMANTOWN, *jėr'man-town:* former borough of Philadelphia co., Penn., but since 1854 the 22d ward of the city of Philadelphia. It is 6 m. n.w. of the old state-house building, was laid out under a grant from William Penn, 1684, and settled by a number of German families under Francis Daniel Pastorius. It is now thoroughly metropolitan in character, has broad and regular intersecting streets, is lighted with gas and electricity, has an ample electric street-car service, contains churches, an academy, high, grammar, and graded public-schools, a community of Vincentian fathers, Rom. Cath. college and seminary, national and savings banks, and numerous charitable institutions.

Germantown was the scene of a defeat of the American Army under Washington by the British under Howe, 1777, Oct. 4. Washington had confined the British fleet in the Delaware river by a series of obstructions, thus preventing a marine attack on Philadelphia. Gen. Howe attempted to aid his brother, the admiral, and sent a portion of his army, then encamped in Germantown, to dislodge the Americans on the Delaware below Philadelphia. As soon as Washington perceived the movement, he concluded to attack the weakened force left at Germantown, and, on the night of Oct. 3, marched his army in four

divisions upon the position. His right under Sullivan and accompanied by himself, with six brigades, was to move down the main street and crush the British left; the Pennsylvania militia to march along the river and take it in flank; the left under Greene was to divide, three brigades under himself taking the British right in front and flank, while two others were to move to the east and come up in its rear. A mile or so north of the British centre on Mount Airy, were a battalion of light infantry and a battery; in a field just left was a regiment under Col. Musgrave; a little south on the main road was the massive stone house of former Chief Justice Chew. At sunrise a heavy fog came up and left all darker than ever. The British advance bodies were overwhelmed by the Americans, and the battery captured; but Musgrave took shelter in Chew's house, and after an unsuccessful attempt at breaching it with the light guns, the Americans left a brigade to besiege it and pushed on. Despite this delay and the warning to the British, both their wings soon began to give way before the American onset. But in the fog, the heavy firing at Chew's house drew Gen. Stephen with his brigade, on Greene's right, too far west, thinking the main fight was there; and Wayne on Sullivan's left had turned considerably east and came in front of Stephen, who took him for the enemy and attacked him in the rear. Wayne's men were driven against the next left of Sullivan's remaining brigades, a panic started, and a general retreat began. The British took the offensive, and reinforced by Cornwallis from Philadelphia, pressed the Americans hard; but the latter soon regained composure and retired in good order, though one regiment of Greene's was surrounded and captured. The American loss in killed and wounded was 673, the British 535. Stephen was accused of having drunk too much on the night march, court-martialed, and dismissed from the army.

GERMANY, *jėr'ma-nĭ*, from Lat. *Germania* (q.v.): English name of the country which the natives call Deutschland, and the French L'Allemagne: see ALEMANNI. The word is sometimes used to denote the whole area of the European continent within which the Germanic race and language are dominant. In this broad sense, it includes, besides Germany Proper, parts of Austria, Switzerland, and perhaps even of the Netherlands; but in the present article the name is to be understood as denoting the existing Germanic Empire, of which Prussia is the head. Germany occupies the central portions of Europe, from 6° to 22° 40′ e. long., and from 49° 7′ to 55° 50′ n. lat. It is bounded on the n. by the North Sea, the Danish Peninsula, and the Baltic; on the e. by Russia and Austria; s. by Austria and Switzerland; on the w. by Luxembourg, France, Belgium, and the Netherlands; area, estimated 208,830 sq.m. or about one-sixteenth of that of all Europe. Pop. about 61,000,000. The coast line measures about 950 miles.

GERMANY.

Following is a list of the states composing the present German empire, with their areas and populations, 1905:

States.	Area in sq. m.	Pop. in 1905.
KINGDOMS—		
Prussia	134,603	37,293,324
Bavaria	29,282	6,524,372
Saxony	5,787	4,508,601
Wurtemberg	7,528	2,302,179
GRAND DUCHIES—		
Baden	5,821	2,011,000
Hesse	2,965	1,283,000
Meeklenburg-Sehwerin	5,135	625,045
Saxe-Weimar	1,388	388,095
Meeklenburg-Strelitz	1,131	103,451
Oldenburg	2,479	398,500
DUCHIES—		
Brunswiek	1,424	485,958
Saxe-Meiningen	953	268,916
Saxe-Altenburg	511	206,508
Saxe-Coburg-Gotha	755	242,432
Anhalt	906	328,029
PRINCIPALITIES—		
Sehwarzburg-Rudolstadt	363	96,839
Sehwarzburg-Sondershausen	333	85,152
Waldeck	433	59,127
Reuss Aeltere Linie	122	70,603
Reuss Jüngere Linie	319	144,584
Schaumburg-Lippe	131	44,992
Lippe-Detmold	469	145,577
FREE TOWNS—		
Lübeek	115	112,500
Bremen	99	282,686
Hamburg	158	951,120
Alsaee-Lorraine	5,600	1,814,564
	208,830	60,777,154

Physical Character.—Germany presents two very distinct physical formations. 1. A range of high table-land, occupying the centre and s. parts of the country, interspersed with numerous ranges and groups of mountains, the most important of which are the Harz and Teutoburgerwald, in the n. the Taunus and Thuringerwald, in the middle; and the Schwarzwald and Rauhe Alps, in the s. and containing an area, including Alsace and Lorraine, of 110,000 sq. m. 2. A vast sandy plain, from the centre of the empire n. to the North Sea, including Slesvig-Holstein: area about 98,000 sq. miles. This great plain, stretching from the Russian frontier on the e. to the Netherlands on the w. is varied by two terrace-like elevations: one stretches from the Vistula into Mecklenburg, not far from the coast of the Baltic, and has a mean elevation of 500 to 600 ft. rising in one point near Danzig to 1,020 ft.; the other line of elevations begins in Silesia and terminates in the moorlands of Lüneburg, in Hanover, its course being marked by several summits from 500 to 800 ft. in height. A large portion of the plain is occupied by sandy tracts interpersed with deposits of peat: but other parts are moderately fertile, and admit of successful cultivation.

In drainage, the surface of Germany belongs to three different basins. The Danube (q.v.) from its source in the Schwarzwald to the borders of Austria belongs to Germany, and through this channel the waters of the greater part of Bavaria are poured into the Black Sea; thus opening communication with the east. By far the greater part of the surface, however (about 185,000 sq. m.), has a northern slope, and belongs partly to the basin of the North Sea, and partly to the basin of the Baltic. The chief German streams flowing into the North Sea are the Rhine (q.v.), the Weser (q.v.), and the Elbe (q.v.); into the Baltic, the Oder (q.v.) and the Vistula (q.v.).

The most important of the numerous canals which connect the great river systems of Germany are Ludwig's canal in Bavaria, which unites the Danube and Main, and thus opens communication between the Black Sea and North Sea; the Finow and Friedrich-Wilhelm's canals in Brandenburg; the Plaue canal, which connects the Elbe and the Havel; and the Kaiser Wilhelm canal, uniting the Baltic and North Seas. Numerous lakes occur both in the table-land of southern Germany and in the low lands of the northern districts, but mostly they are small. Germany abounds in swamps and marsh-lands, especially in the low n. districts. Its mineral springs occur principally in Nassau, Würtemberg, Baden, Bavaria, and Rhenish Prussia. Many of these springs retained have their high reputation from the earliest historic time.

Geology.—The great plain of n. Germany consists of strata of the same age as the Tertiary strata of the Paris basin, covered with very recent sand and mud. Newer tertiary beds occupy the river basin of the Rhine, n. from Mayence; they consist of fine light-colored loam, and contain the bones of the mammoth, rhinoceros, and other contemporaneous mammals. Erratics are scattered over n. Germany. The whole district in the centre of Germany, from the Danube northward to Hanover, consists of Secondary strata. The rocks of the Trias period are best known in Germany, the typical rocks of bunter sandstein, muschel-kalk, and keuper being developed here, so as to justify the suitableness of the name Trias, which is wholly inapplicable in Britain, where the series is represented by sandstone beds only. The Trias is highly fossiliferous, abounding especially in marine shells, and containing several genera of remarkable labyrinthodont saurians. Jurassic rocks occur in central Germany; at Hanover they consist of clays and marl, with beds of sandstone and limestone, containing coal and ironstone of such value that they have been extensively wrought. The Cretaceous strata are frequently highly altered from the intruded igneous rocks, which have raised the beds in some districts to a nearly vertical position, and have altered them into crystalline marbles and silicious sandstones.

Of the Paleozoic rocks, the carboniferous strata are nearly absent in Germany. The coal obtained in the country is from rocks of a later age. True coal-beds are found in

Rhenish Prussia. The sedimentary rocks of the Harz Mountains are chiefly Devonian; to the s.e., near Herzgerode, they are Upper Silurian. They all are greatly dislocated by granite and other intrusive rocks. The Harz Mountains are surrounded by a zone of Permian rocks. The stratified rocks of the Thüringerwald also are Devonian, resting on Lower Silurian strata, the lower portion of which is highly altered into quartzose schists; the remainder consists of graywacke, slate, and sandstone, with limestone and alum slates. There are numerous fucoid and annelid impressions in the older beds, and graptolites, orthoceratites, and trilobites in the newer.

The basaltic rocks, trachytes, and other volcanic products are largely developed in the Eifel, Siebengebirge, Westerwald, Vogels, Rhöngebirge, and other mountain systems of central Germany.

Climate.—The climate of Germany presents less diversity than a first glance at the map might lead to infer, for the greater heats of the more southern latitudes are considerably modified by the hilly character of the country in those parallels, while the cold of the northern plains is mitigated by their vicinity to the ocean. The average decrease in the mean temperature is, in going from s. to n., about 1° F. for every 52 m.; and from w. to e. about 1° F. for every 72 m. The line of perpetual snow varies from 7,200 to 8,000 ft. above the sea. The mean annual fall of rain is 20 inches. The following table shows the mean annual records of the temperature at different points of the continent·

	Mean An. Temp.	Summer.	Winter.
Hamburg.....	47·° Fah.	64° Fah.	30 Fah.
Dresden.....	48·	67	29
Frankfort-on-the-Main..	48·5	66	31
Berlin.....	46·5	66	27
Hanover.....	48·	63	33
Königsberg.....	43·	62	24

Mineral Resources.—Germany possesses varied mineral riches, the most important of which are common coal and brown coal, iron, zinc, lead, and salt. In respect of its mineral wealth the Prussian monarchy takes a prominent place among the states of Europe, especially in the production of zinc. After Prussia the kingdom of Saxony is the most important mining country in Germany. Gold and silver are obtained in the Harz Mountains and in the kingdom of Saxony; gold to a limited extent also in Bavaria. Iron is chiefly obtained in Prussia, Alsace-Lorraine, Bavaria, Brunswick, and Saxony. Copper, lead, and zinc are found chiefly in Prussia. Tin is found only in the kingdom of Saxony; quicksilver, antimony, and sulphur are mainly confined to Prussia; nickel and alum are obtained chiefly in the same state; arsenic chiefly in Saxony, graphite in Bavaria and blue and green vitriol in Prussia, and Saxony. The most extensive coal beds lie in the kingdoms of Prussia and Saxony. Brown coal is obtained also in the duchy of Anhalt. Rock salt is obtained in con-

siderable quantities in Prussia, Anhalt, and Würtemberg. Marble, alabaster, kaolin, calamine, molybdenum, cinnabar, lime, asbestos, slates, millstones, freestones, trass, and sundry precious stones—as amethysts, garnets, etc.—are also found in various localities. Germany is likewise extremely rich in mineral waters, including chalybeat, sulphurous, alkaline, saline, and warm of all kinds.

Agriculture, etc.—Germany is becoming less and less an agricultural and more and more a manufacturing nation, but in many parts agriculture is still the main business of the population. About 65 per cent. of the total area is under cultivation, and of this more than half is under the chief cereals, fully a sixteenth under other corn crops and leguminous plants, nearly a sixth under potatoes, turnips, sugar beet, cabbages, etc., while less than a fiftieth represents orchards and gardens. The empire does not now grow the cereals in sufficient quantity to meet its own requirements, but is becoming increasingly dependent upon imports, especially of wheat and barley from Russia, Hungary, Rumania, and North America. Of the chief cereals, rye occupies the largest area, and next in order come oats, wheat, barley. Spelt is grown in the south and maize also to a small extent. Buckwheat is a northern crop, and potatoes, though grown all over the empire, are most widely cultivated in the north. Flax and hemp thrive best in the central mountainous districts. Hops are raised chiefly in Bavaria (Main valley below Nuremberg), Baden (Carlsruhe district), Hagenau district west of the Rhine, Würtemberg and Posen; sugar beet in an extensive region from Leipsic to Brunswick, including Madgeburg and Halle, around Bautzen in the Breslau-Liegnitz district, near Danzig, Neu-Strelitz, Bromberg, Frankfort-on-the-Oder, etc.; tobacco chiefly in Baden, the Bavarian Palatinate, and Brandenburg.

The chief wine-growing region is the Rhine valley from Baden to Cologne, with the valleys of the Moselle and the Neckar; but other important districts are the Main valley about Würzburg, the valley of the Saale in the Naumburg-Weissenfels district, the Elbe valley at Dresden, parts of the Rhine valley above Strasburg, and a small district north of Görlitz. The growing of vegetables and market gardening generally is most extensively carried on around Berlin, Dresden, Leipsic, Erfurt, Hamburg, Brunswick, and Düsseldorf. Fruit-growing is most successful in the middle and south of the empire, especially in Saxony, Franconia, and the middle Rhine valley.

Stock-raising.—Good horses are reared in the provinces of East and West Prussia, Mecklenburg, Holstein, and Hanover; cattle thrive best on the North Sea coast, in Franconia, the Vogtland, and the Alpine districts; sheep-breeding is declining, but good wool is still obtained from Saxony, Silesia, and Brandenburg, Swine are bred chiefly in Westphalia, Mecklenburg, Pomerania, Bavaria, and Prussian Saxony. The number of domestic animals in Germany at present is estimated at: cattle, 18,939,692;

swine, 16,807,014; sheep, 9,629,501; horses, 4,195,361; goats, 3,266,997.

Manufactures.—The progress of the German manufacturing industry is without parallel among European nations, and is due in large measure to the great advance in technical education. The textile industries give employment to about a million persons, the chief branches being as follows: Cotton in Upper Elsass (Mühlhausen), Saxony (Chemnitz), Rhenish Prussia (München-Gladbach, Elberfeld-Barmen), Würtemburg (Reutlingen), Bavaria (Baireuth, Augsburg), Baden, and Silesia (government of Liegnitz); wool spinning in Rhenish Prussia, Saxony, Würtemberg, and Elsass; woolen cloth in the above districts and also in Lower Lusatia and southeast Brandenburg (Cottbus-Serau district); hosiery in Chemnitz, Glauchau, Plauen, Thuringia, Würtemberg, and Elsass; carpets in Berlin, Barmen, etc.; linen weaving on frontiers of Silesia and Bohemia, Saxony (Zittau), and the Bielefeld district; jute goods in Brunswick, Meissen, etc.; silk in Crefeld, Elberfeld-Barmen, Berlin, Aix-la-Chapelle, Baden, and Lorraine. Three or four hundred thousand persons are employed in the iron and steel manufacture. Its chief seats are: Rhenish Prussia and Westphalia from Düsseldorf to Dortmund, and the Aix-la-Chapelle district; Upper Silesia; and the extreme southern part of the Rhine province between Luxemburg and the Palatinate; but the iron works of Hanover, Saxony, Thuringia, Bavaria, and Würtemberg are also important. The smaller iron industries are chiefly carried on in Solingen, Hagen, Gevelsberg, Remscheid, Aix-la-Chapelle, Iserlohn, Lüdenscheid, Altona, etc. Over 300,000 men are employed in the machinery manufacture, mainly in Rhenish Prussia, Westphalia, Saxony (kingdom and province), Brandenburg (Cottbus to Seraub), Silesia, Bavaria, Elsass, etc. Cassel is the chief place for locomotives, and Berlin, Chemnitz, Dortmund, and Düsseldorf are the chief centres for steam-engines and machine tools. Ship-building is carried on in Bremen, Danzig, Elbing, Flensburg, Hamburg, Kiel, Lübeck, Rostock, Stettin, and Wilhelmshaven, and river steamers are built in Dresden, Mainz, Munich, and elsewhere. Other manufactures of importance are: Plate-glass (Rhenish Prussia, Westphalia, Silesia); bottle-glass (Saxony, Rhenish Prussia, Bavaria, Hanover, Lusatia, etc.); earthenware (Silesia, Hesse-Nassau); porcelain (Meissen, Berlin, Dresden, Silesia, Rhenish Prussia, Thuringia, etc.); bricks, chiefly in the north; tanning (especially Mainz, Worms, Kirn, Malmedy, Saxony); boots, and shoes (Pirmasenz, Mainz, Balingen, Offenbach, Thuringia, Saxony, Silesia); gloves (Saxony, Würtemberg, Berlin); fur goods (Leipsic); gold and silver, brass, and bronze wares; toys (especially Nuremberg and Thuringia); optical, medical, mathematical, musical, and other apparatus and instruments; telegraphic and electrical apparatus and machinery (Aix-la-Chapelle, Berlin, Breslau, Chemnitz, etc.); calcium carbide and acetylene; drugs;

aniline and alizarine dyes; soap and candles; beet sugar (Saxony, Silesia, Rhenish Prussia, Thuringia; trade centres are Magdeburg, Breslau, Berlin, Cologne); brewing (best in Bavaria, Berlin, Dresden); distilling; furniture, cigars (Saxony); lithographic stones (Solnhofen); etc.

Trade and Commerce.—The commercial affairs of Germany, formerly regulated by the *Zollverein* (q.v.), are now managed by committees of the federal council of the empire. The tendency of the imperial policy in this department has of late been more and more in favor of protective tariffs. The total imports of Germany (1877) had a value of $966,750,000; (1878) $930,750,000; (1905) $1,696,660,000; the exports (1877) $673,800,000; (1878) $229,100,000; (1905) $1,364,131,000. The mercantile fleet of Germany is exceeded only by that of Great Britain. The annual imports into Germany from the U. S. amount to over $200,000,000, and the annual exports from Germany to the U. S. to $100,000,000. Cotton is the most important American export.

Railways, etc.—There are now about 35,000 m. of railroad in operation, of which the govt. owned 30,000 m.; 89,348 m. of telegraph in operation, with 331,547 m. of wire, about 230,000 persons employed in the postal and telegraph service. In 1905 the imperial post-office and the separately administered offices of Bavaria and Würtemberg carried together 3,263,325,080 letters, postal cards, etc., and 2,730,625,402 newspapers, printed matter, etc.

Emigration.—Since 1881, when the highest total (220,798) was reached, the annual number of emigrants has greatly decreased. During 1830-87, it is estimated about 4,200,000 emigrants left the country, five-sevenths of whom went to the United States. In 1884 there were 143,586 (139,330 to the United States); (1886) 83,218; (1887) 103,055; (1888) 98,515; (1908) from German and the principal Dutch ports 19,883. By far the largest proportion of emigrants are from Prussia, Bavaria, Würtemberg, Saxony, contributing more than 80% to the total. The census (1905) showed 1,028,560 foreign residents in the empire.

Banking.—The *Reichsbank* or Imperial Bank founded by the *Reichstag* in 1875 is the depository of the imperial treasury, the leading bank of issue, and of imperial banking operations. At its establishment it shared the authority to issue bank-notes with 31 other banks, which number by 1900 had diminished to 7, the Bank of Baden, Bavarian Bank of Issue, the Bank of Brunswick, Bank of Frankfort, Bank of Saxony, South German Bank, and Würtemberg Bank of Issue. The total business of the Imperial Bank in 1900 was $44,982,000,000, its loans on securities alone in that year amounting to $209,400,000. One of its most important branches is the clearing house department. There are clearing houses also in the most important cities, numerous private banks, people's banks, agricultural mortgage banks, and about 150 joint stock banking companies with a total capital in 1900 of over $428,400,000.

Finance.—The total revenue of the empire for 1906–7 was estimated to balance at $570,563,137 and the expenditures at $572,600,260. The chief sources of revenue are the customs, excise duties on tobacco, sugar, salt, and spirits in all the states, an excise duty on beer except in Bavaria, Würtemberg, Baden, and Elsass, stamps, posts, and telegraphs except in Bavaria and Würtemberg, railways, and the *Matricular Beiträge* paid by the federated states to the imperial treasury in proportion to population, but with additions in the case of those states which administer their own posts, telegraphs, and beer duties. The debt of the empire in 1905 was $855,963,454, consisting of 3,023,500,000 marks funded and 572,985,100 marks unfunded. When the German empire had been in existence six years its debt amounted to the insignificant sum of 16,300,000 marks. In 1888, when the old emperor died, it was only 721,000,000—not very large for a nation of importance. Two-thirds of the present debt has been used for naval and military purposes, the rest for civil administration, etc. In 1886 the naval and military estimates amounted to 497,000,000 marks. In the following year they rose to 632,000,000 marks. In 1903 the estimates rose to 972,000,000 marks. From 1897 to 1903 the yearly interests to be paid for loans invested in the army and navy rose from 61,000,000 to 83,000,000 marks. The state revenues for 1903–4 were 1,081,271,985 marks, exclusive of 134,771,300 marks contributed to the imperial treasury which appear in the imperial budget; the expenditures amounted to 1,014,632,056 marks, exclusive of 131,466,154 marks transferred by the imperial treasury.

Constitution and Government.—The constitution of the German empire is based on the decree of 1871, April 16. The presidency of the empire is the privilege of the king of Prussia, to whom belongs the hereditary title of German Emperor. The legislative authority is vested in the Bundesrath, or Federal Council, and the Reichstag, or Imperial Diet. The prerogatives of the emperor are to represent the empire in its relation to other states, to declare war and conclude peace in the name of the empire, to contract alliances and conclude treaties with foreign states, to accredit and receive ambassadors. The assent of the Bundesrath is, however, necessary to a declaration of war, unless the imperial territory be invaded, or its coasts attacked. The emperor has also the supreme command of the army and navy, summons, opens, prorogues, and concludes the Bundesrath and Reichstag, appoints and dismisses officials of the empire, and superintends the consulate.

The Bundersrath consists of 58 representatives of the members of the empire. Of these 17 are returned by Prussia, 6 by Bavaria, 4 each by Saxony and Würtemberg, 3 each by Baden and Hesse, 2 each by Mecklenburg-Schwerin and Brunswick, and 1 each by Saxe-Weimar, Mecklenburg-Strelitz, Oldenburg, Saxe-Meiningen, Saxe-Altenburg, Saxe-Coburg-Gotha, Anhalt, Schwarzburg-

Rudolstadt, Schwarzburg-Sondershausen, Waldeck, Reuss-Greiz, Reuss-Schleiz, Schaumburg-Lippe, Lippe-Detmold, Lübeck, Bremen, and Hamburg. Alsace-Lorraine (Elsass-Lothringen) is represented in the Bundesrath by four commissioners without votes. Every year or every session standing committees of the Bundesrath are appointed by the members from their own number: (1) for the army and fortifications; (2) for the navy; (3) for the customs and other imposts; (4) for trade; (5) for railways, posts, and telegraphs; (6) for justice; (7) for finance; (8) for foreign affairs; and (9) for the affairs of Alsace-Lorraine.

The Reichstag is elected by secret voting in all the states, every German above 25 years of age having a right to vote in the state in which he resides. Members of the army and navy cannot exercise their right of voting while their period of service lasts. Anyone may be returned to the Reichstag who has the right of voting and who has belonged for at least a year to one of the states. As a rule, one member is returned to the Reichstag for every 100,000 of the inhabitants of each state, but every member of the empire sends at least one deputy, even though its population is under that number.

The Reichstag consists of 397 members, namely: 236 from Prussia and Lauenburg, 48 from Bavaria, 23 from Saxony, 17 from Würtemberg, 15 from Alsace-Lorraine, 14 from Baden, 9 from Hesse, 6 from Mecklenburg-Schwerin, 3 each from Saxe-Weimar, Oldenburg, Brunswick, and Hamburg, 2 each from Saxe-Meiningen, Saxe-Coburg-Gotha, and Anhalt, and 1 each from the other states. Proposals of laws are laid before the Reichstag by members of the Bundesrath, or by commissaries appointed by it. Every member of the Bundesrath has the right of appearing in the Reichstag, and has a right to be heard there at any time to represent the view of the government. No one can at the same time be a member of the Bundesrath and the Reichstag. The Reichstag lasts for five years. To dissolve it within that period a decree of the Bundesrath and the assent of the emperor are necessary. In case of a dissolution new elections must take place within 60 days, and the new Reichstag must meet within 90 days. To render an imperial law (*Reichsgesetz*) valid there must be a majority of votes in its favor both in the Bundesrath and in the Reichstag, and nothing else is required. Changes in the constitution may be effected in the same way. Disputes between two or more states of the empire, in so far as the common law courts are incompetent to deal with them, may be settled by the Bundesrath on an appeal being made to that body by either of the parties to the dispute.

The empire has the sole right of legislating on all matters connected with the army and navy, the finances of the empire, commerce, posts and telegraphs (except in Bavaria and Würtemberg), railways in so far as they are deemed necessary for the defense of the country, and proposed modifications of the constitution of the empire.

Certain other matters are left largely to the management of the individual states.

Judiciary.—Since 1879 there exists a uniform system of law courts throughout the empire, although the courts are subjected to state and not to imperial control. There are four grades of courts, the lowest court of first instance being the *Amtsgerichte*, presided over by a judge to try petty civil and criminal cases. Above these district courts are the *Landesgerichte*, territorial courts, exercising a revising jurisdiction over the lower courts and also a more extensive original jurisdiction in both civil and criminal cases. In criminal cases five judges sit, four votes being necessary for a conviction. *Schwurgerichte*, jury courts, are also held periodically, consisting of 12 jurors and three judges. The *Oberlandesgericht* is the first court of second instance, divided into civil and criminal senates, the criminal senate consisting of seven judges. Bavaria alone, by special permission, has an *Oberstes Landesgericht* with 22 judges. The *Reichsgericht* is the supreme or imperial court, and sits at Leipsic. It has 92 judges chosen by the Bundesrath and appointed by the emperor; four criminal and six civil senates; and exercises an appellate jurisdiction over all inferior courts, and an original jurisdiction in cases of treason.

State and Local Government.—In the management of their own affairs the states are practically independent of the empire. Twenty-two of the states are monarchies; three, the free cities, are republics. In all the monarchic states except the two Mecklenburgs there is now constitutional government of a modern type. The Mecklenburgs have a mediæval diet of great landholders and city magistrates. Of the free cities, Lübeck has a government of a restricted democratic type; Hamburg and Bremen have governments of a mixed type.

In the larger states, notably in Prussia, the localities, especially the municipalities, enjoy a very considerable degree of self-government. Municipal self-government in Prussia dates from the reforms of Stein, at the beginning of the 19th century. An analogous system for the rural districts was established by Bismarck. The leading features of the Prussian system are compulsory and unpaid service on the part of those called to local offices, and the control of the local administration by elected councils. The Prussian system has been imitated in many of the other states.

Education.—Education is more generally diffused in Germany than in any other country of Europe, and is cultivated with an earnest and systematic devotion not equalled in extent among other nations. There are 21 universities: Berlin, Breslau, Halle, Bonn, Greifswald, Munich, Würzburg, Erlangen, Leipsic, Tübingen, Göttingen, Heidelberg, Freiburg, Marburg, Giessen, Jena, Rostock, Kiel, Königsberg, Münster, and Strasburg. These have four faculties, Theology, Law, Medicine, and Philosophy; and had in 1902, 2,976 professors and teachers,

and 36,890 students. Of the 21 universities of the empire 14 are Prot., i.e., in the dept. of theology they teach only Prot. theology; three, besides that of Münster, are Rom. Cath., viz., Freiburg, Munich, and Würzburg; three, viz., Bonn, Breslau, and Tübingen, are mixed. There are a number of polytechnic schools; numerous special schools of technology and trade, of agriculture, forestry, mining, architecture, music and art, navigation and other branches of study; seminaries for teachers and theologians; and more than 59,364 elementary schools with about 150,000 teachers and 9,000,000 pupils. There are also 666 private elementary schools with 40,000 pupils. In Prussia there are over 12,000 students at the public training colleges. In the public elementary schools of Prussia there are over 90,000 teachers and about 35,000 assistants and the pupils number nearly 6,000,000. There are 319 public intermediate schools for boys and children of both sexes where 86,965 pupils receive instruction from 2,500 teachers; 137 public intermediate schools for girls with 47,800 pupils and 1,400 teachers; 220 public high schools for girls, with 60,000 pupils and 2,500 teachers, and numerous private institutions. There is also a Real gymnasium for girls at Berlin, opened in 1906. Compulsory education reduces the number of wholly illiterate persons to singularly small proportions.

Public libraries—of which there are more than 150—museums, botanical gardens, art-collections, picture-galleries, schools of music and design, and academies of arts and sciences, are in most of the capitals, and in many of the country towns, more than 200 of which possess one or more permanently established theatres. In no country is the book and publishing trade more universally patronized than in Germany. The press annually sends forth 8,000 to 10,000 works, while about 3,000 papers and journals are circulated throughout the empire; of the current newspapers, a comparatively small number only exert marked influence, but many of the German scientific and literary periodicals have world-wide reputation. The censorship of the press was abolished by a decree of the diet of 1848, and freedom of the press under certain restrictions, promulgated 1854, has been introduced.

Army and Navy.—1. *Army.*—By the constitution of 1871, Apr. 16, the Prussian obligation to serve in the army is extended to the whole empire; article 59 prescribes that every German who is *wehrfähig*, i.e., 'capable of bearing arms,' must be in the standing army from his 21st year to his 28th year. Of these seven years, three must be spent in active service (*bei den Fahnen*), the remainder in the army of reserve. On quitting the army of reserve, he has to form part of the *Landwehr* (q.v.) for another five years. Article 63 enacts that *die gesammte Landmacht des Reichs wird ein einheitliches Heer bilden, welches im Krieg und Frieden unter dem Befehle des Kaisers steht* ('the whole land-forces of the empire shall form a united army, in war and peace, under the command

of the emperor'). The sovereigns of the principal states have the right to select the lower grades of officers, but even their selections require to obtain the approval of the emperor, whose authority is paramount; article 64 expressly declaring that 'all German troops are bound to obey unconditionally the orders of the emperor.' The peace strength of the army is as follows: officers, 25,559; non-commissioned officers, 85,480; privates, lance corporals, etc., 503,708; volunteers, 11,000; total, 625,747. The total amount of trained men available (excluding Landsturm) is over 3,000,000. The number of men in the Ersatz Reserve and Landsturm is about 4,500,000. All but 800,000 have been trained. In time of war the army is divided into (1) Field troops, (2) Field reserve troops, (3) Landwehr troops, (4) Depot troops and (5) Landsturm troops. The troops of the German army in time of peace form 630 battalions of infantry, 494 squadron of cavalry, 574 battalions of field and horse artillery, 38 battalions of artillery, 26 battalions of Pioneers, 8 battalions of railway troops, 3 battalions of telegraph troops, 23 battalions of train troops. See ARMIES, MODERN, *Germany*.

2. *Navy.*—The formation of a German navy, due to the initiative of Prussia, dates from 1848, and of late years rapid progress has been made. In 1910, Jan. the effective ships of the imperial fleet consisted of battleships, 34; building or projected, 11; coast-defense ships, 11; armored cruisers, 9; protected cruisers, 6; small cruisers, 35; sea-going gunboats, 30; river gunboats, 12; torpedo boat destroyers, 73; and torpedo boats, 84. There were also transports and despatch vessels, tugs, repair, water, coal, hospital, depot, and special service (school and training ships) subsidized ships and 4 submarines. The personnel for the same year was comprised of 2,361 officers, 260 surgeons, 207 paymasters, 2,308 warrant officers and 10,777 petty officers and 36,205 seamen, 1,650 ships' boys; total 5,137 officers and officials, and 48,632 men. The empire has three ports of war: Kiel (q.v.) and Danzig (q.v.) on the Baltic, and Wilhelmshaven (q.v.) in the Bay of Jahde on the North Sea, the latter of granite, with 5 basins, and dry-docks for ironclads.

Religion.—In general Protestantism predominates in the n. and Roman Catholicism in the s., though very few states exhibit exclusively either form of faith. The following is the proportion of the different denominations, according to the census of 1905: Prot. (Lutheran and Calvanist) 37,646,852; Rom. Cath. 22,109,644; Jews, 607,862; and other religions about 270,000.

Political Organization.—All the states of the empire recognize four distinct orders—viz., the nobility, clergy, burghers, and peasantry, and all distinguish three grades of nobility. The highest grade includes the members of reigning houses, and the descendants of families who belonged at the time of the old empire to the sovereign nobility of the state, and were *reichsunmittelbar*, or

directly connected with the empire, as holding their domains directly under the emperor, but whose houses have substantially been *mediatized*, or deprived of sovereign power in accordance with special treaties between the state and the princes. There are at present 50 princely and 51 *gräfliche* (countly) mediatized families, who, in accordance with the act of the diet of 1806, have equality of rank with reigning houses, with many of the special privileges which were accorded to the high nobles of the empire. The second grade of nobility is composed of counts and barons not belonging to reigning or mediatized houses; the third and lowest grade includes the knights and hereditary patrimonial proprietors.

Before considering the political organization of the new Germanic empire, a view may be taken of two subjects—1st, the principal features of the constitution of the old Germanic empire, overthrown by the First Napoleon 1806; 2d, that Bund or federal govt. which lasted from 1814 till Austria was excluded from the Confederation, 1866, and the hegemony of Germany was transferred to Prussia.

The Old Germanic Empire.—The states of that empire comprised three chambers or colleges: 1. The Electoral College, consisting of the archiepiscopal electors of Mainz, Treves, and Cologne; and the secular electors, of whom there were originally only four, but whose number was subsequently increased to five, and who at the dissolution of the empire were represented by the sovereigns of Bohemia, Bavaria, Saxony, Brandenburg, and Brunswick, Lüneburg or Hanover (see ELECTORS). 2. The College of the Princes of the Empire, who had each a vote in the diet, and were divided into spiritual and temporal princes. 3. The Free Imperial Cities, which formed a college at the diet, divided into two benches, the Rhenish with 14 cities, and the Swabian with 37; each of which had a vote. These colleges, each of which voted separately, formed the diet of the empire. When their respective decisions agreed, the matter under discussion was submitted to the emperor, who could refuse his ratification of the decisions of the diet, though he had no power to modify them. Ordinary meetings were usually summoned twice a year by the emperor, who specified the place at which the sittings were to be held, which, during the latter periods of the empire, were at Regensburg (Ratisbon). The diet had the right to enact, abrogate, or modify laws, conclude peace and declare war, and impose taxes for the general expenses of the state. The Aulic Chamber, and the Cameral or chief tribunal of the empire, decided in cases of dispute between members of the diet. The emperors were chosen by the electors in person or by their deputies; and after their election and coronation, both usually at Frankfort-on-the-Main, the emperor swore to the 'capitulation' or constitution of the empire. After the dissolution of the empire 1806, its place was nominally taken by the Confederation of the Rhine, which owed its existence to Napoleon, and which lasted till 1815.

GERMANY.

Late Germanic Confederation.—The late Germanic Confederation was established by act of the Congress of Vienna 1815, on the overthrow of Napoleon. It was an indissoluble union, from which no single state could at its own pleasure retire. Its central point and its executive and legislative powers were represented by the federative diet, which held its meetings at Frankfort-on-the-Main, and was composed of delegates from all the confederated states, chosen, not by the people, but by the various governments. The diet deliberated either in a limited council (the Federative govt.) or as a general assembly (*Plenum*). In the limited council there were 17 votes, of which 11 of the principal states each had a single vote, while the remaining states divided the six collective votes between them. The Plenum, which met only when any organic change was to be effected in the diet itself, embraced 70 votes, of which Austria and the five German Kingdoms each had four, while the other states had 3, 2, or 1 vote each in proportion to their importance. It rested with the limited council, which executed the enactments of the Plenum, and dispatched the ordinary business of the Confederation, to decide (by a majority of voices) whether a question should be submitted to the Plenum, where it was not debated, but simply decided by a majority of ayes or noes. Austria presided in both assemblies, and had a casting voice in cases of equality. The diet, as a collective body, had the right of concluding peace and alliances, and declaring war; but this power could be exercised only for the maintenance of the independence and external security of Germany, and the individual integrity of the several federative states, which on their part were bound to submit to the diet the consideration of all questions in dispute between themselves and other powers. Where such differences could not be settled by the committee empowered by the Plenum to consider them, they were finally referred to a special tribunal known as the 'Austrägal' Court, which was composed of several members of the Confederation invested for the time with full powers.

North German Confederation.—The immediate occasion of the war of 1866 was the difference that arose between Prussia and Austria as to the occupation and disposal of the territory taken from Denmark (see SLESVIG) after the Convention of Gastein (1865). But the real grounds lay in the rivalry between the two states for the leadership of Germany, the germ of which is as old as the time of the Great Elector (see FREDERICK-WILLIAM), and which has shown itself at many epochs of the history (see above, *History*). There can be little doubt that the feeling of the German people as distinguished from the princes and bureaucracy, has, in recent times at least, been in favor of the purely German Prussia as their leader, rather than Austria, the great mass of whose population are Slavs and Magyars. And when the parliament of Frankfort, 1850, offered the imperial crown to the king of Prussia, the

unity of Germany might have been secured without bloodshed, had the monarch been resolute, or had he had a Bismarck for his adviser. But that opportunity being let slip, and the incubus of the 'Bund' being restored, it became apparent that the knot must be cut by the sword.

By the treaty of Gastein, Austria and Prussia agreed to a joint occupation of the Elbe duchies; but to prevent collision, it was judged prudent that Austria should occupy Holstein, and Prussia Slesvig. Already a difference of policy had begun to show itself: Prussia was believed to have the intention of annexing the duchies; while Austria began to favor the claims of Prince Frederick of Augustenburg, and wished to refer the disposal of the matter to the Bund. In the meantime, both nations were making ready for the struggle. In fact, the preparations of Prussia had been going on for two or three years; and the new organization of her army, which had occasioned the protracted contest between the govt. and the house of deputies, had been made with a view to some such eventuality as was now to occur. The preparations of Austria were made more openly, as she could plead the necessity of meeting the warlike attitude of Italy; which power, looking upon the quarrel between Austria and Prussia as a precious opportunity, was actively arming, with a view to strike a blow for the liberation of Venetia, and had secretly entered into an alliance with Prussia.

At this crisis, England, France, and Russia invited the disputants to a conference. Prussia and Italy readily consented; but nothing came of it, through the obstinate pride of Austria, who would not allow her position in Italy to be even taken into consideration. Never perhaps, was a greater blunder made. Had she at this moment ceded Venetia for a reasonable compensation, she would have replenished her empty treasury with many millions, have made Italy friendly or at least neutral, and set free her best army of 80,000 veterans for the inevitable contest with her northern rival. A few weeks later, she made the concession with a bad grace, without compensation, and to no purpose.

On the failure of the conference, Benedek, commander-in-chief of the Austrian army of the north, issued an order of the day, dated May 12, in which he announced that he had been appointed to 'lead the brave and faithful Austrian army against the unjust and wanton foes of the empire.' It remained only to find a formal ground for the declaration of war, and that ground was found in the Slesvig-Holstein question. In the sitting of the German diet, 1866, June 1, Austria, disregarding the Convention of Gastein, placed the whole matter at the disposal of the Bund, and then proceeded to convoke the states of Holstein 'to assist in the settlement of the future destination of the duchy.' Prussia protested against this as an insult and a violation of treaty; demanded the re-establishment of the joint occupation; and, while inviting Austria to send troops into Slesvig, marched troops of her own into Hol-

stein. Instead of responding to this invitation, Austria withdrew her forces altogether from Holstein, under protest; and then, calling attention to this 'act of violence' on the part of Prussia, proposed that the diet should decree 'federal execution' against the enemy of the empire. This eventful resolution was carried by a great majority, 1866, June 14; Hanover, Saxony, Hesse-Cassel, Hesse-Darmstadt, and the 16th Curie voting for it. The resolution having passed, the Prussian plenipotentiary, in the name of his govt., declared the German Confederation dissolved for ever, and immediately withdrew.

When the news of the federal execution was received in Berlin, identical notes were sent to the courts of Saxony, Hanover, and Hesse-Cassel, demanding the reduction of their armies and assent to the convocation of a common German parliament; on which condition, Prussia would guarantee their territories and sovereign rights as her allies. Twenty-four hours were allowed for the decision; and when the term had expired without assent, the Prussian troops, previously concentrated on the frontiers, crossed at once into the three kingdoms, and took military possession without resistance. The Saxon army retired into Bohemia to join the Austrians; that of Hanover, after vainly trying to make its way south to join the army of the Bund and bringing on the useless affair of Langensalza, was forced to lay down its arms, and return home.

Besides the moral advantage gained by this display of promptitude in paralyzing her declared enemies and securing the adhesion of waverers, Prussia had by these occupations secured her rear, and, in Saxony, had won a favorable basis for operating against Austria. The Prussians now lost no time; war was declared against Austria; and, following the example set by Frederick the Great, the troops immediately began to march into Bohemia. To their own surprise, as well as that of all Europe, they were allowed to pass the easily-defended defiles without opposition, or even seeing an enemy. So great was the reputation of Benedek, that every one now began to look for some deep-laid plan by which the enemy was to be enticed into the heart of the country, only to be completely and at once overwhelmed. But, as it turned out, there was no plan at all. With their usual sluggishness, the Austrians were taken by surprise in a state of unreadiness—ill organized, ill equipped, ill provisioned; and though in actual engagement the soldiers fought bravely, they were animated with a very different spirit from their opponents. The Prussian people had at the outset been rather averse than otherwise to the war; and in some places, it required strong measures to make the Landwehr take the field. But once under arms, and as the object of the struggle became more apparent, they entered into it with enthusiasm, and manifested a rare combination of soldierly qualities, the results of a universally diffused education and military training, and while such was the quality of the men, seldom has an army taken the field so well organized, with the plan of

the campaign so well laid, the arms so efficient, and the equipments in every way so complete.

The Prussian host invaded Bohemia at three several points: the central army, under Prince Frederick-Charles (q.v.) entered from e. Saxony, crossing the frontier range of the Erzgebirge by Krottau, Friedland, and Neustadt, toward Reichenberg; the western or 'Elbe' army under General Herwarth von Bittenfeld, started from Dresden, and entered Bohemia by Neustadt and Schlukenau toward Gabel; while the eastern or 'Silesian' army, under the crown-prince, Frederick William, afterward German emperor, Freder'k III. (q.v.), invaded from Silesia by the Landshut and Nachod passes, marching toward Trautenau and Skalitz. The first of these armies numbered 72,000 infantry, 11,000 cavalry, 294 guns; the second, 34,000 infantry, 3,900 cavalry, 132 guns; the third, 92,000 infantry, 12,500 cavalry, 348 guns—in all, 225,400 men, 774 guns. To oppose these, the Austrians had 55,000 infantry, 5,400 cavalry, and 172 guns (inclusive of the Saxon army, which had been withdrawn into Bohemia on the approach of the Prussians), under Count Clam-Gallas, stationed along the frontier n. of Turnau and Leitmeritz; and 186,000 infantry, 16,000 cavalry, and 544 guns, under Marshal Benedek, commander-in-chief, in Eastern Bohemia, behind the Riesengebirge—in all, 262,400 men and 716 guns. As the Austrians expected the attack from Silesia, by far the greater portion of their army was stationed behind the Riesengebirge; so that when Von Bittenfeld and Prince Friedrich-Karl crossed the Erzgebirge (June 24), they found themselves opposed by only the outlying brigades of Clam-Gallas, which they forced to retire toward Turnau and Münchengrätz, after defeating them in some insignificant combats at Reichenberg, Langenbrück, Liebenau, and Turnau, and in a severe struggle at Podol, which cost the Austrians in all 2,400 killed, wounded, and prisoners; the loss of the Prussians being only 124 men. The first and second Prussian armies, now united, advanced leisurely, driving the enemy toward Münchengrätz, where Clam-Gallas had strongly posted himself, and where, June 28, he was attacked by the combined Prussian armies, and after a brief but severe contest, forced to retreat in haste. By several routes, the combined armies under Friedrich-Karl continued their march, routing the detached corps of Austrians and Saxons which attempted to bar their progress; and after a severe contest (June 29), which cost the Prussians 2,000 men, and the Austrians about 4,000, took possession of Gitschin, and encamped on the following morning between that town and Horzitz, having established communications with the crown-prince; while Gallas retired to join the main body under Benedek, after having, with a force only half as numerous as his opponents', and still more inferior in guns, compelled his antagonists to spend six days in making an advance of 40 English miles.

Meanwhile the third Prussian army had advanced in two

divisions, the right wing through the passes of the Riesengebirge by Landshut, toward Trautenau; the left by Glatz, toward Nachod and Skalitz; while the centre divisions crossed by Braunau, all crossing the frontier June 26. The defiles were traversed without opposition, the Austrians being posted only at the mouths of the passes; but as the left wing under Steinmetz debouched toward Nachod, it was assailed (June 27) by Ramming's Austrian corps, and driven back into the pass. Steinmetz, however, persevered and by the aid of his guns, and repeated charges of cavalry, succeeded, after a conflict of six hours, in extricating his corps from the defile, at a cost of 1,191 killed and wounded, to 6,000 on the part of the Austrians. Both armies being reinforced, the contest was renewed at Skalitz on the 28th; but, though long and bloody, it was on all sides favorable to Steinmetz, who beat the Austrians back upon Josephstadt, with a loss in killed and wounded of 5,815, and 5,850 prisoners, with five guns. The Prussian right wing, under Bonin, also had a double conflict with the Austrians, who were posted to receive them; for, after extricating themselves from the Landshut defile, and seizing Trautenau, they were met (June 27) by General Gablentz, and, after a long-continued fight, were driven back to their previous camping-ground, losing, however, only 1,423 men, to about 3,500 of the Austrians. Gablentz being much exhausted with his hardly-won victory, obtained reinforcements from Benedek; and the Prince of Würtemburg, with a corps of Guards, being sent by the crown-prince (who marched with the centre, ready to afford support to either wing when necessary) to attack Gablentz by Eypel, fell upon him (June 28) while he was preparing to complete the defeat of Bonin, and, after a severe combat, or rather series of partial unconnected combats, the Austrians were this time defeated, with a loss of 4,000 men, and an equal number of prisoners; the Prussian loss being only 834 killed and wounded. The three Prussian armies having thus effected a firm lodgment in Bohemia, moved steadily forward in lines, converging to a point n. of the Austrian army, which was now concentrated between Josephstadt and Königgrätz; and the king of Prussia, who had arrived (July 1) at the headquarters of the 1st and 2d armies, hearing of Benedek's intention to assault them before the crown-prince's army could come to their aid, resolved to anticipate him, and ordered an attack on the Austrian position, July 3, 8 A.M., at the same time sending off an urgent dispatch to hasten the arrival of the crown-prince, whose host, at 8 A.M. on the 3d, was 15 m. off. The Prussians, at the commencement of the fight, believed they had to do with only the half of the Austrian army, but they were soon undeceived, for, after carrying the villages in front of the Austrian position, and advancing up the slope, they were met by such a crushing fire of artillery as completely stopped their progress. Benedek then directed his reserves against the Prussian left, in order to cut it off from the crown-prince, but all his endeavors to drive it per-

manently from its position failed. The conflict, mainly an artillery-fight, thus continued without intermission, and the Prussian left was almost on the point of giving way before the overwhelming numbers of its assailants, when the wavering of the Austrian right unmistakably showed that a portion at least of the third army had arrived, and attacked them in flank. This new assailant becoming more formidable every minute, speedily rolled up the Austrian right wing; and the advance of the 1st and 2d armies, by partially inclosing the Austrians between two fires, threw them into great confusion. Their array was soon broken, and dissolved in precipitate flight; multitudes perished in the morasses, in the waters of the Elbe, and under the wheels of the fleeing baggage-wagons; but the undaunted attitude of the splendid Austrian cavalry, and the deficiency of the Prussians in that arm, greatly mitigated the horrors of the rout. The Prussians lost more than 9,000 killed and wounded; the Austrian loss was 16,235 killed and wounded, and 22,684 prisoners. After this decisive defeat, known as the battle of Königgrätz, or Sadowa, all hope of staying the advance of the Prussians by the army of Benedek was at an end; a truce was asked for, but refused; and the victorious Prussians pushed forward toward Vienna, whither Benedek had drawn his beaten forces. At the same time, the southern Austrian army, which had been employed against the Italians, was collected at the capital, and every precaution was taken, by the erection of entrenchments, fortifications, etc., to insure the safety of Vienna, when, by the agency of the emperor of the French, a truce was agreed to, which afterward led to a treaty of peace.

A few days before this campaign had commenced, the Italians, burning with eagerness to free Venetia from the yoke of the alien, and combining, with all the enthusiasm and heroic spirit of a young nation, no small portion of its overweening presumption, had assembled an army of 200,000 men, one-half of which, under Gen. Della Marmora, was intended to cross the Mincio between Peschiera and Mantua; while the other half was stationed round Bologna, to operate on the lower Po. To oppose this force, the Archduke Albert, commander-in-chief in Venetia, had about 90,000 men near Verona; besides the garrisons of the Quadrilateral and Venice, not available for field-service. On June 23 (on which day it was notified to the archduke that hostilities would be commenced), La Marmora's army crossed the Mincio, unopposed by the Austrians; and the Italian commander, not expecting attack, masked the fortresses of Peschiera and Mantua, and marched the rest of his army forward in a somewhat careless fashion. The archduke, however, had been all along watching his opponent; and after having succeeded in entangling him between the river and the hills, he attacked him (June 24) with his whole force. The Italian left was speedily broken and driven back, and would have been wholly destroyed had not Gen. Pianell, whose division was on the right bank

of the Mincio, crossed the river, and held the assailants at bay during the rest of the day. The Austrian attack on the Italian right was, however, at first unsuccessful. In the centre, where were the village of Custoza and Monte Belvedere, the keys of the position, an obstinate struggle was maintained on both sides throughout the day, but toward 4 P.M. victory inclined to the Austrians, and soon afterward they gained possession of the position which decided the day. The Italians fell back, in fair order, toward the Mincio, unpursued by their exhausted opponents, and, on the following day, were all assembled again on the right bank of the river. The Italians lost, in killed, wounded, and prisoners, 8,175 men, and several pieces of artillery; while the loss of the Austrians was about 8,000 men. This plan of the campaign having failed, the Italian generals set about devising another, and spent more than a week in deliberation and discussion. At the end of this time, news came of the great defeat which the Austrians had sustained in the north, and of the cession of Venetia, by the Emperor of Austria, to the Emperor Napoleon. Though it was not for a moment in doubt that this cession was only a roundabout way of surrendering the province to Italy, the Italian govt., true to the Prussian alliance, refused to conclude a separate treaty; and (the archduke's army having been, as above mentioned, withdrawn for the defense of Vienna) Cialdini's army crossed the Po (July 7) and occupied Padua, Vicenza, and Treviso; while Garibaldi, at the head of his volunteers, and Gen. Medici, with a division of Cialdini's army, advanced up the Lake of Garda into the Trentino, the small body of Austrians in the district being wholly unable to offer a successful resistance to such an overwhelming attack. Not content, however, with attacking Austria by land, a fleet was equipped and dispatched under Admiral Persano, to assail the Dalmatian coast and retrieve for Italy by her navy the disgrace which had fallen upon her army; and accordingly Persano directed an attack on the island and forts of Lissa, and failed. News of this attack being communicated to Admiral Tegethoff, commander of the Austrian fleet in the Adriatic, he sailed at once for the relief of Lissa; and though his ships were inferior in number, size, and weight of ordnance, and only 7 of them ironclads to 12 more powerful vessels for the same sort in the Italian fleet, he bravely led his ships to the attack, destroyed or sank two of the largest of the enemy's vessels, broke through his fleet, and took up a position in front of Lissa, ready to renew the fight if necessary. The Italian fleet, however, drew off, and on the following morning was out of sight, making for Ancona.

Thus baffled both on land and sea, Italy, though vigorously professing her determination to go hand in hand with Prussia, was very loath to agree to the armistice signed by the two belligerent German powers at Nikolsburg, July 26; and attempted to salve her chagrin by in-

sisting upon the surrender by Austria to her of the Trentino. Prussia, however, having agreed with Italy only for the cession of Venetia, was not inclined to support this demand; and Italy, seeing that she must either make peace or fight for the Trentino single handed against Austria, gave way reluctantly, and agreed to the armistice, Aug. 12.

A third contest was, about the same time, in progress between Prussia and those minor states of Germany which had raised armies to support Austria, viz., Bavaria, Würtemberg, Baden, and Hesse-Darmstadt. After the capture of the Hanoverian army, the Bavarians, who, under Prince Charles of Bavaria, had been advancing slowly to join them, took post, June 30, at Suhl, in the valley of the Werra. A second army had been assembled under Prince Alexander of Hesse-Darmstadt, and had been drawn together in front of Frankfurt. To prevent the junction of these two armies, the Prussian general, Vogel von Falkenstein, who had 48,000 infantry, 3,300 cavalry, and 96 guns, threw a part of his forces forward toward Fulda, and with the remainder attacked the Bavarians, who were inferior in number, and routed them at Dermbach, Kaltenordheim, and Hünfeld, driving them toward Kissingen; he then turned his superior force against Prince Alexander, whom he forced to retreat toward Darmstadt. The two armies were now completely separated, and Von Falkenstein found little difficulty in keeping them apart during the rest of the brief campaign, and in routing the Bavarians at Kissingen and Hammelburg, and the Darmstadters at Aschaffenburg, and driving the broken remnants of the two armies s. of the Main. He then crossed the Main and occupied Würzburg, in Bavaria. After some little delay, peace was concluded between these four minor states and Prussia; but, unlike Austria, of which they were merely the allies, some of them were forced to submit to a certain loss of territory.

The states n. of the Main which had taken up arms against Prussia were completely incorporated with Prussia —viz., Hanover, Hesse-Cassel, Nassau, Frankfurt, and a small portion of Hesse-Darmstadt, as well as Slesvig-Holstein and Lauenburg; and the other states n. of the Main were united with Prussia in a confederacy of a more intimate nature than before existed, called the *North German Confederation.*

Bavaria, Baden, Würtemberg, the part of Hesse-Darmstadt s. of the Main and Liechtenstein, were not included in this union, but were invited to reform their armies and enter into a closer mutual relationship, with a view to a military and political connection with the Confederation.

Saxony, which had prominently figured in the contest as an ally of Austria, was doomed by Count Bismarck to incorporation; but Austria, supported by France, so steadily opposed this arrangement that it was abandoned, and the little kingdom was admitted into the Confederation.

Austria, by the treaty of Prague (1866, Aug. 23), was

completely excluded from participation in the new organization of the German states, and formally agreed to the surrender of Venetia to Italy, to the incorporation of Slesvig-Holstein with Prussia, and to the new arrangements made by Prussia in Germany. A portion of the fifth article of this treaty secured that, if the 'inhabitants of the northern districts of Slesvig declare, by a free vote, their desire to be united to Denmark, they shall be restored accordingly.' Though losing no territory to Prussia, Austria had to pay 40 millions of thalers for the expense of the war, after which payment the Prussian troops were to be withdrawn from Austrian territories.

Saxony resigned to Prussia the right of garrisoning Königstein, and of partially garrisoning Dresden, and paid ten million thalers war-indemnity; Bavaria (by treaty of Berlin, Aug. 22) surrendered several districts of Lower Franconia to Prussia, and paid 30 millions gulden war indemnity; Baden (by treaty of Berlin, Aug. 17) and Würtemberg (by treaty Aug. 13) surrendered no territory, but paid, the former six, and the latter eight, millions gulden; while Hesse-Darmstadt (by treaty of Berlin, Sep. 3) surrendered various districts of the province of Ober-Hesse, receiving in return several districts formerly belonging to Electoral Hesse, Nassau, and Frankfurt, and paid three millions of gulden war expenses; also, the province of Ober-Hesse, into which were to be incorporated the districts ceded by Prussia, was to form a part of the North German Confederation, the other parts of the grand duchy s. of the Main being unconnected with it. Even the little principality of Reuss had to pay 100,000 thalers into the fund for Prussian invalids.

The North German Confederation, as thus constituted, possessed a common parliament, elected by universal suffrage, in which each state was represented according to population. The first or constituent parliament met early in 1867, and was employed in deliberating over the details of the proposed constitution for the Bund, which was drawn up and submitted to it by Count Bismarck. After some weeks' discussion, the draft, with a few modifications, was agreed to; the new elections took place, and the first regular North German parliament met 1867, Sep. According to this constitution, there was to be a common army and fleet, under the sole command of Prussia; a common diplomatic representation abroad, of necessity little else than Prussian; and to Prussia also was intrusted the management of the posts and telegraphs in the Confederation.

The s. German states, which till this point had not joined the Bund, were Bavaria, Baden, Würtemberg, Hesse-Darmstadt, and Liechtenstein, with a joint area of 43,990 sq. m. But though these states were not formally members of the Bund, they were so practically, for they were bound to Prussia by treaties of alliance offensive and defensive, so that in the event of a war the king of Prussia would have at his disposal an armed force of more than 1,100,000 men.

In the spring of 1867, a war between Prussia and France seemed imminent, from difficulties arising out of the occupation of Luxembourg by the former; but by the good offices of the British govt., a congress was assembled at London, at which representatives of the great powers (Italy included) were present, and an arrangement satisfactory to both nations was amicably agreed upon, the province under dispute remaining in the possession of the king of Holland. Though the outbreak of hostilities was thus averted for the present, neither nation entirely gave up the thought of war, and on both sides extensive military preparations were carried on.

During the next few years, the North German Confederation was employed in consolidating and strengthening itself, and in trying to induce the southern states to join the league. The Zollverein (q.v.) was remodelled and extended, until, in 1868, every part of Germany was a member of it, with the exception of the cities of Hamburg and Bremen, and a small part of Baden. This paved the way for the formal entrance of the s. German states into the confederation; but they still hung back, though it daily became more evident that a united Germany would soon be an accomplished fact.

In 1870, the long-threatened war between Prussia and France broke out. On July 4 of that year, the provisional govt. of Spain elected Prince Leopold of Hohenzollern, a relative of King William of Prussia, to fill their vacant throne. This step gave the greatest umbrage to the French govt., and the Paris journals almost unanimously asserted that the accession of this prince to the Spanish throne would be tantamount to the re-establishment of the empire of Charles V., in favor of Prussia. M. Benedetti, French minister at Berlin, was instructed to ask explanations from King William; and, though by the advice of that monarch, Prince Leopold resigned his candidature, the French govt. was not satisfied, but demanded an assurance that Prussia would at no further period sanction his claims. This assurance the king refused to give; and July 23, Louis Napoleon, Emperor of the French, proclaimed war against Prussia. Contrary to the expectation of France, the s. German states at once decided to support Prussia and the northern states, and placed their armies, eventually commanded by the Crown-Prince of Prussia, at the disposal of King William.

Early in Aug. the forces of both countries were congregated on the frontier. Napoleon, however, lost a fortnight in delays after the declaration of war, and it was discovered that the French army was far from a state of satisfactory preparation, while the Germans were splendidly organized, and much superior in number. The result was, that the French, instead of marching to Berlin as they anticipated, never crossed the Rhine, and had to fight at a disadvantage in Alsace and Lorraine.

On Aug. 2, the French obtained some unimportant success at Saarbruck, but on the 4th a brilliant victory was

achieved by the army of the Crown-Prince of Prussia at Weissenburg. This was followed by the victory of Wörth on the 6th, in which the French, under MacMahon, lost 4,000 prisoners, and were pursued toward Metz. On the same day, the French under General Froissard were again defeated at Spicheren, and lost 2,500 prisoners. On the 14th the Prussians occupied Nancy, and on the 16th the French army under the command of Bazaine was driven back on Mars-la-Tour. The battle of Gravelotte, in which King William commanded in person, was fought on the 18th; and, though the Germans suffered immense loss, they were again victorious, and forced Bazaine to shut himself up in Metz. The losses of the French in these last three days' fighting amounted in dead alone to more than 12,000 men. About 4,000 prisoners were made at Gravelotte. Emperor Napoleon and Marshal MacMahon in vain attempted to proceed to the relief of Bazaine. They were surrounded at Sedan, and completely defeated with heavy loss. The emperor surrendered Sep. 2, with his whole army, about 90,000 men, and was sent as a prisoner into Germany. By Sep. 19 the Prussians had reached Paris, and commenced a vigorous siege. Strasburg capitulated on the 27th after a severe bombardment; and Oct. 28, Bazaine surrendered Metz with an army of 6,000 officers and 173,00 men, 400 pieces of artillery, 100 mitrailleuses, and 53 eagles. Verdun capitulated Nov. 8; Thionville followed on the 24th; after which were several capitulations of lesser importance.

The French made extraordinary efforts to raise armies and relieve Paris, but, with the exception of a momentary gleam of success on the Loire, they met with nothing but severe defeats. Of these were the battle of Dec. 3 in the Forest of Orleans, and that of Le Mans, Jan. 12, in which contests Prince Frederick Charles took altogether 30,000 prisoners. After numerous unsuccessful sorties, and enduring great sufferings from famine, Paris surrendered Jan. 29, and the war was virtually at an end. The French army of the east 80,000 strong, under Bourbaki, was compelled to retire to Switzerland on the 31st. France was condemned to pay a war indemnity of 5 milliards of francs, or $1,000,000,000; and the province of Alsace, with the German part of Lorraine, was ceded to Germany. For further account of this war, see FRANCO-GERMAN WAR.

German History.—After the gradual expulsion or retirement of the Romans from Germany, the country necessarily became subdivided into numerous petty states, each governed by its own chief. The erection of the Franko-Merovingian empire in France had given preponderance to the Frankish power on both sides of the Rhine, and when Charlemagne succeeded 771, to the German as well as the Gallic possessions of his father, Pepin d'Heristal, he found himself possessed of an amount of territory and a degree of influence which speedily enabled him to assert supremacy over the whole of w. Germany, while his conquests over the heathen Saxons in the n., and the Avari in

the s.e., extended his German dominions from the North Sea to the Alps, and from the Rhine to Hungary. With Charlemagne, who received the imperial crown and title of *Roman* emperor from the pope 800, began the line which occupied the German throne for a thousand years. With him, too, the vast fabric of the *Holy Roman Empire*, which he had reared on the ruins of Roman power, lost its stability, for at his death 814, no member of his family was competent to wield the imperial sceptre, although in 843 some portions of his German possessions fell, in accordance with a family compact, to his grandson Ludwig, surnamed 'the German,' who was recognized as king of Germany. On the extinction, 911, of the degenerate Carlovingian dynasty in the person of Ludwig 'the Child,' the provincial rulers, who, together with the archbishop, bishops, and abbots, constituted the chief members of the diet or national assembly, arrogated to themselves (in imitation of the practice of the nobles of the ancient German tribes) the right of electing their sovereign, who, however, could not assume the imperial title till he had been crowned by the pope. At this period, there were in Germany five nations—the Franks, Saxons, Bavarians, Swabians, and Lorrainers. The Franks as the descendants of those who had conquered the land and founded the empire, had pre-eminence over the others; hence, on the extinction of the Carlovingian race, the choice of the prince-electors seems to have fallen almost of course on the chief of the Franks, the Duke or Count of Franconia, who reigned as king of Germany 911–918, under the title Conrad I. At his own instigation, his rival and adversary, Henry, Duke of Saxony, was chosen as his successor, and proved himself an able and war-like prince. The conquests which he gained over the Danes, Slaves, and Magyars were confirmed and extended by his son and successor, Otho I. (reigned 936–973), who carried the boundaries of the empire beyond the Elbe and Saale, and who, by his acquisition of Lombardy, laid the foundation of the relations which existed for many ages between the rulers of Germany and the Italian nation. Otho's coronation-festival was eventful, as it formed the precedent for the exercise of those offices which, till the dissolution of the empire, were regarded as connected with the dignity of the secular electors, for on that occasion, while the emperor dined with his three spiritual electors, he was waited upon by the secular princes—the Elector of Bavaria (afterward Saxony) serving as grand-marshal; of Swabia (afterward Bohemia), as grand-cupbearer; and of Lorraine (afterward Brandenburg), as arch-chamberlain.

Otho II. (reigned 973–983), Otho III. (reigned 983–1002), and Henry II. (reigned 1002–24), belonged to the House of Saxony, which was succeeded by that of Franconia, in the person of Conrad II. (reigned 1024–39), an able ruler, who added Burgundy to the empire. His son and successor, Henry III. (reigned 1039–56), extended German supremacy over Hungary, part of which he con-

quered and annexed to Lower Austria, while he repressed the insolence and despotism of the temporal and spiritual princes of Germany, and gained the respect of his contemporaries by his zeal for justice and his valor in the field. The minority of his son and successor, Henry IV. (reigned 1056–1106), enabled the nobles to recover much of their former power, and to apply a check to the further consolidation of the imperial authority, which had been considerably extended in the two preceding reigns. Henry's constant quarrels with the astute Gregory VII. entangled him in difficulties and mortifications which ended only with his life, and which plunged Germany into anarchy and disorder, and entailed upon the empire destructive wars convulsing the whole of continental Europe for more than two centuries. With his son and successor, Henry V. (reigned 1106–25), the male line of the Franconian dynasty became extinct; and after the crown had been worn (1125–38) by Lothaire of Saxony, who made a bold attempt to recover some of the prerogatives of which at his election the empire had been deprived through papal intrigues, the choice of the electors, after a season of dissension and intrigue, fell upon Conrad III., Duke of Franconia, the first of the Hohenstauffen dynasty (reigned 1138–52). His reign, in which the civil wars of the Guelphs and Ghibellines began, was distracted by the dissensions of the great feudatories of the empire, while the strength of Germany was wasted in the disastrous Crusades, in which Conrad took an active part. On his death, the electoral college for the first time met at Frankfurt, which retained the honor of being the place at which the sovereign was elected and crowned till the dissolution of the empire in the 19th c. Frederick I. (reigned 1152–90), surnamed Barbarossa, Duke of Swabia, was, at the recommendation of his uncle Conrad, chosen as his successor, and the splendor of his reign fully warranted the selection. By the force of his character, Frederick acquired an influence over the diets which had not been possessed by any of his immediate predecessors, and during his reign many important changes were effected in the mutual relations of the great duchies and counties of Germany, while then for the first time appeared the *hereditary* right possessed by certain princes to exercise the privilege of election. Unfortunately for Germany, this great monarch suffered the interests of his Italian dominions to draw him away from those of his own country, while his participation in the Crusades, in which both he and the flower of his chivalry perished, was memorable only for the misfortunes which it entailed on the empire. The interval between the death of Frederick Barbarossa (1190) and the accession of Rudolf I. (1273), first of the Hapsburg line which through a female branch, still reigns in Austria, was one of constant struggle, internal dissension, and foreign wars. Individually, the princes of the Hohenstauffen dynasty were popular monarchs, their many noble and chivalrous qualities having endeared them to the people,

while one of the race, Frederick II. (reigned 1212–50), was, after Charlemagne, perhaps the most remarkable sovereign of the middle ages; but their ambitious designs on Italy, and their constant but futile attempts to destroy the papal power, were a source of misery to Germany; and with Frederick II. ended the glory of the empire, till it was partially revived by the Austrian House of Hapsburg. His son, Conrad IV. (reigned 1250–54), after a brief and troubled reign, was succeeded by various princes, who in turn, or in some cases contemporaneously, bore the imperial title without exercising its legitimate functions or authority. This season of anarchy was terminated at the accession of Rudolf I. (reigned 1273–91), who, by the destruction of the strongholds of the nobles, and the stringent enforcement of the laws, restored order. His chief efforts were, however, directed to the aggrandizement of his Austrian possessions, which embraced Styria, Carinthia, Carniola, and Tyrol.

For the next 200 years, the history of the German empire presents very few features of interest, and may be briefly passed over. Adolf of Nassau, who was elected to succeed Rudolf, was compelled 1298 to yield the crown to the son of the latter, Albrecht I. (reigned 1298–1308), whose reign is chiefly memorable as the period in which three Swiss cantons, Unterwalden, Schwytz, and Uri, established their independence. After the murder of Albrecht, the throne was occupied in rapid succession by Henry VII. (reigned 1308–13), who added Bohemia to the empire; and conjointly by Frederick of Austria and Ludwig of Bavaria (reigned 1313–49). Charles IV. (reigned 1349–78) of Luxembourg was the successful candidate among many rivals, and though he attended specially to the interests of his hereditary possessions of Bohemia, Moravia, Silesia, and Lusatia, he did not entirely neglect those of the empire, for which he provided by a written compact, known as the *Golden Bull*, which regulated the rights, privileges, and duties of the electors, the mode of the election and coronation of the emperors, the coinage, customs, and commercial treaties of the empire, and the rights and obligations of the free cities. His son, Wenceslaus (reigned 1378–1400), who was finally deposed, brought the royal authority into contempt, from which it was scarcely redeemed by Ruprecht of the Palatinate (reigned 1400–10). The nominal reign of Sigismund (reigned 1410–37), brother of Wenceslaus, would demand no notice were it not for his connection with the Councils of Constance and Basel, at the former of which Huss was condemned, and which was followed by the disastrous Hussite wars. The readiness with which Sigismund lent himself to the interests of Henry V. of England, and of all other princes who ministered to his love of personal display, brought discredit on the imperial dignity, while his dishonorable desertion of Huss will ever attach ignominy to his name. Albrecht II. of Austria (reigned 1438–40), after a brief reign of two years, in which he gave

evidence of great capacity for governing, was succeeded by his cousin, Frederick III. (reigned 1440–93), an accomplished but avaricious and indolent prince, whose chief object seemed to be the aggrandizement of the House of Austria, with which the title of emperor had now become permanently connected (see AUSTRIA), while he neglected the interests of Germany collectively, and suffered the infidels to make unchecked advances upon its territory. Maximilian I. (reigned 1493–1519), son and successor of Frederick, resembled him in few respects, for he was active, ambitious, and scheming, but deficient in steadiness of purpose. His marriage with Mary, rich heiress of her father, Charles the Bold of Burgundy, involved him in the general politics of Europe, while his opposition to the reformed faith preached by Luther exasperated the religious differences which disturbed the close of his reign. Maximilian had, however, the merit of introducing many improvements in the internal organization of the state, by enforcing the better administration of the law, establishing a police and an organized army, and introducing a postal system. With him originated, moreover, the special courts of jurisdiction known as the 'Imperial Chamber' and the 'Aulic Council;' and in his reign, the empire was divided into 10 circles, each under its hereditary president and its hereditary prince-convoker. Maximilian lived to see the beginning of the Reformation, and the success that attended Luther's preaching; but the firm establishment in Germany of the reformed faith, and the religious dissensions by which its success was attended, belong principally to the reign of his grandson, Charles I., King of Spain (son of the Archduke Philip and of Joanna, heiress of Spain), who succeeded to the empire under the title of Charles V. (reigned 1519–56). The management of his vast possessions in Spain, Italy, and the Netherlands, and the wars with France, in which he was so long implicated, diverted him from his German territories, which he committed to the care of his brother Ferdinand. The princes of Germany were thus left to settle their religious differences among themselves, and to quell, unaided by the head of the state, the formidable insurrection of the peasants (1525), which threatened to undermine the very foundations of society. This rising of the lower orders was due to the preaching of the fanatic Münzer, and other leaders of the sect of Anabaptists, which had arisen from a perverted interpretation of some of the tenets advanced by Luther. Charles's determined opposition to the reformers rendered all settlement of these religious differences impracticable; and though by the aid of his ally, Maurice of Saxony, he broke the confederation of the Prot. princes, known as the Union of Smalkald, he was forced by his former ally to make concessions to the Lutherans, of which he disapproved; and in his disgust at the complicated relations in which he was placed to both parties, he abdicated in favor of his brother Ferdinand (reigned 1556–64), who put an end to much of the religious dissension that had hith-

erto distracted the empire, by granting entire toleration to the Protestants. Although Ferdinand was personally mild and pacific, his reign was troubled by domestic and foreign aggressions—the different sects disturbing the peace of the empire at home, while the French and the Turks assailed it from abroad. During the next 50 years, the empire was a prey to internal disquiet. Maximilian II. (reigned 1564–76) was indeed a wise and just prince, but the little he was able to effect in reconciling the adherents of the different churches, and in raising the character of the imperial rule, was fatally counteracted by the bigotry and vacillation of his son and successor, Rudolph II. (reigned 1576–1612), in whose reign Germany was torn by the dissensions of the opposite religious factions, while each in turn called in the aid of foreigners to contribute toward the universal anarchy which culminated in the Thirty Years' War, begun under Rudolph's brother and successor Matthias (reigned 1612–19); continued under Ferdinand II. (reigned 1619–37), an able but cruel and bigoted man; and ended under Ferdinand III. (reigned 1637–57), by the treaty of Westphalia, 1648. The effect of the Thirty Years' War was to depopulate the rural districts of Germany, destroy its commerce, burden the people with taxes, cripple the already debilitated power of the emperors, and cut up the empire into a multitude of petty states, the rulers of which exercised almost absolute power within their own territories. Leopold I. (reigned 1658–1705), a haughty, pedantic man, did not avail himself of the opportunities afforded by peace for restoring order to the state, but suffered himself to be drawn into the coalition against France, while his hereditary states were overrun by the Turks. Although success often attended his arms, peace brought him no signal advantages. The reigns of Joseph I. (reigned 1705–11) and Charles VI. (reigned 1711–40), with whom expired the male line of the Hapsburg dynasty, were signalized by the great victories won by the imperialist general, Prince Eugene, in conjunction with Marlborough, over the French; but they brought no solid advantage to the empire. The disturbed condition of Spain and Saxony opened new channels for the interference of Germany, which was further distracted, after the death of Charles, by the dissensions occasioned by the contested succession of his daughter, Maria-Theresa, and, through her, of her husband, Francis I. of Lorraine (reigned 1745–65), after their rival, the Bavarian elector, Charles VII., had, through the intervention of Prussian aid, been elected 1742 to the imperial throne, which, however, he was forced to cede, after a brief occupation of three years. Constant disturbances, intensified during the Seven Years' War, when Frederick the Great of Prussia maintained his character of a skilful general at the expense of the Austrians, made the reign of these sovereigns one of trouble and disaster. Joseph II., their son (reigned 1765–90), during the lifetime of Maria-Theresa, who retained her authority over all the Austrian

states, had little that was imperial beyond the title Emperor, to which he had succeeded on his father's death. But when he ultimately acquired his mother's vast patrimony, he at once entered on a course of reforms, which were, however, premature, and unsuited to the cases to which they were applied; while his attempts to re-establish the supremacy of the imperial power in s. Germany were frustrated by Prussian influence. Leopold II., after a short reign of two years, was succeeded 1792 by his son, Francis II., who, after a series of defeats by the armies of the French republic, and the adhesion, 1805, of many of the German princes to the alliance of France, which led to the formation of Rhenish Confederation under the protectorate of Napoleon, resigned the crown of the Holy Roman Empire, and assumed the title Emperor of Austria. From this period till the Congress of Vienna of 1814–15, Germany was almost entirely at the mercy of Napoleon, who deposed the established sovereigns, and dismembered their states in the interest of his favorites and dependents, while he crippled the trade of the country, and exhausted its resources by the extortion of subsidies or contributions.

As a reconstruction of the old empire was no longer possible, those states which still maintained their sovereignty combined, 1815, to form a German Confederation. Of the 300 states into which the empire had once been divided, there now remained only 40, a number since reduced by the extinction of several petty dynasties. The diet was now reorganized, and appointed to hold its meetings at Frankfort-on-the-Main, after having been formally recognized by all the allied states as the legislature and executive organ of the Confederation; but it failed to satisfy the expectations of the nation, and soon became a mere political tool in the hands of the princes, who simply made its decrees subservient to their own efforts for the suppression of every progressive movement. The French revolution of 1830 reacted sufficiently on a few of the German states to compel their rulers to grant written constitutions to their subjects; but the effect was transient; and it was not till 1848 that the German nation gave expression, by open insurrectionary movements, to the discontent and the sense of oppression which had long possessed the minds of the people. The princes endeavored, by hasty concessions, to arrest the progress of republican principles, and, fully recognizing the inefficiency of the diet, they gave their sanction to the convocation, by a provisional self-constituted assembly, of a national congress of representatives of the people. Archduke John of Austria was elected Vicar of the newly organized national govt.; but he soon disappointed the hopes of the assembly by his evident attempts to frustrate all energetic action on the side of the parliament, while the speedy success of the anti-republican party in Austria and Prussia damped the hopes of the progressionists. The refusal of the king of Prussia to accept the imperial crown which the parliament offered him. was followed by the election of a provisional regency

of the empire: but as nearly half the members had declined taking part in these proceedings, or in a previous measure, by which Austria had been excluded, by a single vote, from the German Confederation, the assembly soon lapsed into a state of anarchy and impotence, which terminated in its dissolution. The sanguinary manner in which insurrectionary movements had, in the meanwhile, been suppressed by Prussian troops both in Prussia and Saxony, put an effectual end to republican demonstrations; and 1850, Austria and Prussia, after exhibiting mutual jealousy and ill-will, which more than once seemed likely to end in war, combined to restore the diet, whose first acts were the intervention in Slesvig-Holstein in favor of Denmark, and the abolition of the free constitutions of several of the lesser states. After that period, the diet became the arena on which Austria and Prussia strove to secure the supremacy and championship of Germany; and every measure of public interest was made subservient to the views of one or other of these rival powers. These states did, however, conclude a treaty of alliance 1854, guaranteeing to each other the mutual defense of their possessions against all enemies—a compact in which the diet soon joined. In 1858, a currency convention was concluded between all the states of the German Confederation, which had previously entered into similar alliances for the adjustment of international postal and commercial relations; and in the same year the diet adopted a resolution by which the Danish govt. was called on to submit to the legislative assemblies a new project for the political organization of the duchies of Holstein, Lauenburg, and Slesvig. In 1859, after many stormy discussions, the assembly passed a resolution to mobilize the whole federal army, and to appoint the Prussian prince regent commander-in-chief, subject to the control of the diet, or virtually of Austria, with which rested the casting-vote in the federal assembly. This appointment did not satisfy the views of Prussia, which, however, abstained, for a time, from making any direct attempt to secure the political leadership in Germany. The anti-Napoleonic feeling, which at a later period swelled to such a tide, manifested itself decidedly during the difficulties between France and Austria 1859; and the discussions and apprehensions to which this sentiment gave rise, together with the consideration of the Slesvig-Holstein difficulties, constituted the principal questions under discussion in the federal parliament, until the rupture between Prussia and Austria, and the dissolution of the Bund 1866. See FRANCE: FRANCO-GERMAN WAR.

A noticeable movement in Germany since the war with France, is its ecclesiastical contest with the Church of Rome, which owed its immediate outbreak to the pope's refusal to receive the German ambassador 1872. This was followed by the expulsion of the Jesuits from Germany; an act to which the pope replied by an allocution asserting the supremacy of the laws of the church over those of the

WILLIAM II. EMPEROR OF GERMANY.
In Admiral's Uniform.

state. The Falk laws, whose general principle is that all religious societies are subject to the laws and supervision of the state, were then passed, and several German prelates, protesting against their principles and provisions, refused to submit their ecclesiastical arrangements to the inspection of the government, and threatened to excommunicate such of the clergy as should comply. The matter admitting of no compromise, the govt. resolved to carry out the laws, and several of the refractory bishops were expelled from Germany. In 1875 Germany passed a law making marriage a civil rite, and the pope issued an encyclical letter declaring the Falk laws invalid. See further, OLD CATHOLICS: DÖLLINGER. The serious disorganization that ensued in the affairs of the church led in 1878–9, under the more conciliatory auspices of the new pope, Leo XIII., to attempt at a compromise or *modus vivendi* between the empire and the papal see—at first without effect, but later with a resumption of friendly relations between the imperial govt. and the Roman see. Meanwhile the struggle of the state with Socialism had taken the foremost place in public interest. The repeated attempts on the life of the emperor, 1878, were attributed more or less directly to the Socialistic organization, of late notoriously increasing in strength; and the attempted assassination was the signal for legislative measures giving the administration very extensive powers for checking or suppressing the influence of Socialism. Recent legislation and the new tariffs are strongly protectionist. More cordial relations with Austria led 1879 to an Austro-German alliance. The years 1880–1 were marked by the revival of a spirit of hostility against the Jews in various parts of the empire, causing much excitement, though but few breaches of the peace resulted. Several persons of high standing uttered themselves in justification of the feeling of suspicion cherished by the populace against the Semitic race, which was alleged to be acquiring a dangerous influence in the public life and learned professions of Germany. Emigration to America assumed almost alarming proportions; 250,000 Germans forsaking their fatherland in a single year. Bismarck's scheme of compulsory insurance for workmen—repeatedly brought forward—was regarded as of the nature of 'state socialism,' and was keenly opposed by the progressists, without securing the support of the liberals. The tobacco monopoly, zealously promoted by the chancellor, was not sanctioned by the legislature or by the general election 1881. Emperor William I. died 1888, Mar. 8; was succeeded by Emperor Frederick William III., who died 1888, June 15, and was succeeded by Emperor William II. Prince Bismarck (q.v.) resigned the office of chancellor 1890, Mar. 17, and was succeeded by Gen. Caprivi. In 1888–9 conflicts on the chief of the Samoan Islands led to diplomatic correspondence with the United States; and 1890 Germany surrendered rights in Africa to Great Britain, in return for the cession to it of Heligoland (q.v.).

GERMANY.

Early in 1890 the emperor endeavored to force the passage of his education bill, whose chief feature was compulsory religious instruction in the primary schools. This bill discriminated in favor of certain denominations, and met with opposition so strong that it had to be withdrawn. On March 29 the Reichstag passed a bill permitting the govt. to declare Alsace-Lorraine in a state of siege in case of war, and the chancellor effected commercial treaties with the members of the Triple Alliance with Switzerland and Belgium. In 1892 a new army bill was presented to the Reichstag by which 4,500,000 men will be available in 1916. The most important event of 1893 was the attempt to pass an army bill which called for a peace force of more than 500,000 men and a war force of 4,400,000. This increase involved an additional expense of $14,696,000. The bill called for 84,000 additional recruits annually, and caused a storm of opposition. Compromises were offered but none accepted, and the measure was defeated by 58 votes. The Reichstag was dissolved and the question of armament referred to the people. The election returns (1893) showed that in the new Reichstag the govt. had 205 votes as against 172 hostile to the army bill. On the final reading of this measure it passed by a majority of 16.

Anti-semite agitations of some violence, led by Rector Ahlwardt, who represented New Stettin in the Reichstag, received much attention throughout the year. Ahlwardt in his political addresses declared that German official life was corrupted by the influence of Jewish bribes. Although sentenced to imprisonment for libels on prominent officials Ahlwardt persisted in his agitation. Recently he visited the United States, where he received little encouragement as a 'Jew-baiter.' In 1893, Feb., the agrarian movement developed unexpected strength, and a congress of 4,000 delegates met in Berlin to protest against the granting of advantages to foreign imports, and to condemn commercial treaties with foreign countries, as injurious to home industries. The agrarian party became powerful in the Reichstag.

The consideration of duelling and military reform occupied the Reichstag during 1896, and in Oct. a measure dealing with these subjects was laid before the federal council. Early in 1897 the emperor issued a decree urging that thereafter duels be effectively prevented.

In 1884–5 Germany proclaimed a protectorate in various unoccupied parts of Africa and in the Pacific Ocean and began her foreign empire. In 1897 she seized the harbor and city of Kiaochau and secured from the Chinese government a long lease of this city with the adjacent territory, and in 1898 purchased from Spain the Caroline, Pelew, and Ladrone Islands. In 1900 she established exclusive control over a portion of the Samoan group. Germany's possessions in Africa comprise over 900,000 square miles of territory and in the Pacific about 95,000 square miles.

GERMANY.

The chief problems of the empire within recent years have been consequent upon the determination of her statesmen that Germany must stand on her own feet in respect to her army and navy and be ready to face all coalitions. The necessity for this was felt largely on account of a somewhat aggressive development of foreign commercial relations. German export trade has been encroaching upon that of the other nations, especially Great Britain. A disposition to consult the demands of the foreign markets, especially those of the Far East, having resulted in a considerable measure of success, it was not unnatural that some commercial hostility should arise. Added to this, German steamship companies, through superior equipment, made severe inroads upon the carrying trade, which up to the end of the last century was so predominantly in the hands of Great Britain. Germany now ranks second among the countries of the world that own shipping.

In order to continue this progress, upon which the future of the empire so largely depends, Germany believed it necessary to undertake the gigantic task of placing her army and navy in the very front rank of the powers. With the case of the navy, the expenditures have been enormous, and the finances have been in an unsatisfactory condition for some years. The imperial estimate of expenditures for 1909 was about $750,000,000, and of this, $125,000,000 were totally unprovided for in the budget. The government proposed to meet nearly the whole of this deficit by new taxation, a measure which aroused the country, and especially the interests affected. The passing of the law in June, 1909, resulted in the retirement of Chancellor von Bülow, who was succeeded by Dr. von Bethmann-Hollweg. The unpopularity of the new taxes and the increase of taxation, especially those on matches and tobacco, was shown in the marked advance of the Socialistic vote at the October elections. The problem of money raising is further complicated on account of the threatened invasion by the empire of the field of direct taxation upon which the separate states depend.

Externally, the empire's relations with the world have been, on the whole, pacific. Some coercive actions have had to be undertaken, as, for example, in 1902, against Hayti and Venezuela, against the latter in concert with Italy and England. In 1903 the Triple Alliance was renewed for 12 years. In 1909 the vexed Morocco question was settled between France and Germany, the latter country recognizing the special interests of France in Morocco, and agreeing not to impede them. Germany's most recent warlike experiences have been in her African possessions. In 1903 the Hereros in South West Africa, and the following year the Hottentots in the East, were in rebellion. It took elaborate measures and some time to subdue them.

German Language and Literature.—The numerous dia-

lects spoken by the different confederacies and tribes of ancient Germany were all derivatives from one branch of the Aryan or Indo-Germanic family of languages, which separated from the parent stock at a very early period, though subsequently to the separation of the Celtic. We can trace the co-existence of the two branches of Teutonic speech known as Low-German and High-German as far back as the 7th c., but there is no evidence that they existed as common uniform languages, from which their variously modified dialects were respectively derived. According to the eminent philologist Max Müller, there never was *one* common Teutonic language which diverged into two streams; while the utmost we can venture to assert in regard to the various High and Low-German dialects is, that they respectively passed at different times through the same stages of grammatical development. The High-German branches—spoken in the dialects of Swabia, Bavaria, and Austria, and parts of Franconia and Saxony—has been the literary language of Germany since the days of Charlemagne. It may be classified under three periods the Old High-German, dating from the 7th c., extending to the period of the Crusades, or the 12th c.; the Middle High-German, beginning in the 12th c., continuing till the Reformation; and the New High-German, dating from Luther's time to our own days. The Low-German, which in Germany itself has been little used in Literature, comprehends many dialects, as the Frisian (q.v.), the Flemish, Dutch, Platt-Deutsch, etc. The oldest literary monument of Low-German belongs to the 9th c., and is a Christian epic known as *The Heiland* (the Healer or Savior); and though there are traces of popular Low-German literature till the 17th c., the translation of the Bible into High-German by Luther decided the fate of Low-German. In addition to the various dialects commonly included under High and Low-German, an important evidence of the cultivation of a form of German differing equally from the high- and low groups has been preserved. This important linguistic monument is a fragment of a Gothic translation of the Bible, made in the 4th c. by Bp. Ulfilas, and used by all the Gothic tribes when they advanced into Italy and Spain. The Gothic language died out in the 9th c.; and after the extinction of the power of the Goths, the translation of Ulfilas was forgotten and lost sight of till the accidental discovery, in the 16th c., of a MS. preserved in the abbey of Werden, and containing fragments of this important work. This MS. is a copy made in the 5th c. of Ulfilas's translation, and fragmentary as it is, it affords evidence of the high degree of development to which this dialect had been carried, and exhibits a form of speech which belongs to neither the High nor Low German group, but possibly may have been merely one among numerous allied forms of Teutonic speech which have perished.

The diffusion of Christianity among the Germanic tribes had the effect both of suppressing the use of the Runic characters that had been common to them, and of changing

the nature of their literature, for instead of the heroic songs and 'beast-epics' of a sanguinary paganism (*Thier-epos*), scriptural paraphrases, legends, and hymns were selected; while the ancient form of alliteration by degrees gave place to the rhythmical arrangement of the Latin versification common in the early periods of the middle ages. Latin, moreover, became the language of the court, the church, and the law under the Saxon emperors, while German was left entirely to the people, until the new ideas, which were diffused both in regard to literature and language during the Crusades under the rule of the accomplished emperors of the Hohenstauffen line, had the effect of reviving the use and cultivation of the vernacular dialects, among which the Swabian, as the language of the court, soon acquired marked preponderance. In that age of chivalry and romance, the art of song was cherished by princes and nobles, many of whom belonged to the order of the *Minnesänger* (or Singers of Love), and composed in the Swabian or High-German dialect of the imperial court. The subjects chiefly selected during the 13th and 14th c., both by courtly and by popular singers, were based on the legendary lore of Charlemagne and his paladins, and King Arthur and his knights, and of the Sangrael; and it is to this period that we must refer the *Nibelungen Lied* and *Gudrun*, the greatest treasures of German national literature. Among the most successful poets and minnesingers belonging to the Swabian period, were Heinrich von Veldeke, Hartmann von der Aue, Wolfram von Eschenbach, Walther von der Vogelweide, Neidhart of Bavaria, Heinrich von Ofterdingen, etc. The taste for the *Thier-epos* received a new impetus among the people in the middle of the 12th c. by the re-translation, from the Walloon into German, of the ancient poem of *Reinhard Fuchs*, which, according to the distinguished philologist Jakob Grimm, originated with the Frankish tribes, who carried it with them when they crossed the Rhine and founded an empire in Gaul, and from whom it was diffused among the neighboring tribes of n. France and Flanders.

The period which succeeded the decline of chivalry was marked by a thorough neglect, among the higher classes, of national literature, which thus fell into the hands of the people, to the utter disorganization of all principles of grammar. To this age belongs, however, the great mass of the *Volkslieder*, or national ballads, in which Germany is specially rich; the fables and satires of Brand and of Sachs, and the romances of the satirist Johann Fischart. The mysteries and passion-plays, which were at their height in the 15th c., and still linger in the village of Oberammergau, in Upper Bavaria, may be said to have given origin to the German drama, which numbered among its earliest cultivators, Sachs, Rebhuhn, and Ayrer. The close of the 15th c. was prolific in rhyming historical chronicles, in satires on the clergy, and in theological writings for and against the tottering power of the Roman Church. The writings of Luther, his translation of the Bible, and the

works of Ulrich von Hutten, Zuinglius, and of many of the other reformers, were the most important events in German literature from the close of the 15th to the middle of the 16th c.; and it must be remembered that Luther addressed himself to the minds of his countrymen not merely through his polemical writings, but also by those noble hymns, which, since his day, have constituted one of the greatest literary treasures of the kind. Some of the best of these *Kirchen-lieder*, or church songs, were composed by Luther himself; while next to him those of Speratus, Decius, Nicolai, and Herberger, have perhaps found most favor both among Germans and among foreigners. These fervent effusions of the devout and eloquent reformers were followed by a period of literary degeneration and stagnation, in great measure to be ascribed to the demoralizing effects of the Thirty Years' War, when Germany was a prey to all the evils inseparable from civil war fostered by foreign interference. The indirect result of this period of anarchy was to quench the national spirit, and vitiate the popular taste; for while the petty courts aped the habits, language, and literature of Versailles, the lower orders forgot their own literature, with its rich treasures of legends, tales, and ballads, and acquired a taste for the coarse camp-songs imported by foreign mercenaries, and the immoral romances borrowed from impure French and Italian sources. German poetry in the 17th c. was framed after the model of the later classics, and their modern imitators. The study of the genuine national literature was neglected, and although a host of learned societies were formed, whose professed object was to purify and elevate the public taste, the results were lamentably unsatisfactory; and it was not till J. C. Gottsched (1700–66) succeeded in his *Critical Art of Poetry* in drawing attention to the turgid pedantry and artificial stiffness of the classicist school, that a better taste was awakened. His own pretentious bigotry gave origin, however, to a counter-party, from which emanated, headed by Bodmer (q.v.), the German æsthetic school, under the guidance of A. Baumgarten and G. Meier. A favorable reaction then took place and with the names of Klopstock, Lessing, and Wieland, began the brilliant epoch of modern German literature. Their influence was alike great and varied; for while Klopstock's poem of the *Messiah*, and his odes, in which he had taken Milton as his model, re-echoed the tender piety of the old reformers, and were so thoroughly German in their spirit that they at once met with an enthusiastic response in the hearts of the people, Lessing's tragedy of *Minna von Barnhelm*, and his drama of *Nathan der Weise*, may be said to have created anew the dramatic art in Germany. Wieland, on the other hand, the complete antithesis of Klopstock—though, like his two great contemporaries, he was the founder of a new style, and gave a graceful flexibility to German diction, which it had never before been made to assume—had imparted to his numerous tales and romances an undisguised sensuous material-

ism, which, like his style, had been borrowed from the French philosophers of his day, and thus introduced into the language and literature of Germany the germs of many defects, as well as graces, to which they had previously been strangers. The influence exerted on German literature by these three writers, who may be regarded as its regenerators, was soon appreciable in every branch of knowledge; and among the galaxy of great names which have imparted renown to the literary and scientific annals of Germany during the last 100 years, we can instance only a few of the principal writers who have especially enriched their several departments of learning.

Philosophy, which in Germany originated with Leibnitz, who, however, wrote in Latin and French, assumed an individuality and completeness through the intellectual acumen and subtle analysis of Kant, Fichte, Schelling, and Hegel, which have no parallel in any other country. Other names worthy of mention are Herbart, Schopenhauer, Feuerbach, Baader, Lotze. In theology, Reinhard, Paulus, Schleiermacher, Neander, Julius Müller, Lücke, Baur, Strauss, Möhler, Döllinger, and a host of others, have infused new life into biblical inquiry; while invaluable aid has been afforded in the same direction by the profound philological and critical researches of Wolf, Hermann, Müller, the erudite brothers Grimm, Bopp, Benecke, Adelung, Lassen, Rosen, Schlegel, W. Humboldt, Lepsius, Bunsen, Benfey, etc. In archeology, history and jurisprudence, all nations owe gratitude to Winckelmann, Heeren, Von Raumer, Schlosser, Von Hammen, Gervinus, Dahlmann, Ranke, Niebuhr, Curtius, and Mommsen. In poetry and belles-lettres, the name of Goethe (1749–1832) is a host in itself. He had been preceded in the school to which he attached himself, known as that of the *Sturm-und-Drang* period, by Herder, its originator, whose philosophical critiques of foreign and German literature, contributed materially to the complete literary revolution which ushered in the modern period of German poetry. In *Leiden des Jungen Werther* (The Sorrows of Werther), Goethe carried the sentimental tendencies of the school to their culminating point; but his own later and very numerous works were marked by philosophic insight, breadth of view, and consummate strength. The *Sturm-und-Drang* period closed with Schiller (1759–1805), whose early works, *The Robbers*, *Fiesco*, and *Don Carlos*, threw the whole German people into a frenzy of excitement. His later dramatic works, though less exciting than these, gave evidence of more matured taste, while some of his ballads and lyrics may be said to be unrivalled. In the present century, poetry has found noble representatives in the so-called *Vaterlandsdichter* (Poets of the Fatherland), among whom are Theodor Körner, and Arndt, whose spirited patriotic songs are intimately associated with the war of 1813 against Napoleon, in which the former fell fighting gloriously. F. Rückert and L. Uhland belong to the

same school; but the former is known especially for his admirable adaptations and translations from the Oriental languages, and the latter for his exquisite romances and ballads. A still greater name is that of Heine, who may rank almost with Goethe and Schiller in poetic power. The names of Müller, Hoffmann von Fallersleben, Platen, Freiligrath, Geibel, amid a crowd of others, are highly esteemed in their native country. The influence of Goethe and Schiller extended in a marked degree to the drama and to novel writing. In the former department Iffland acquired great reputation as a writer of sensation dramas, A. von Kotzebue as an inexhaustible composer of light effective comedies, A. Müllner v. Honwald, F. Grillparzer, and E. Raupach, for historical and social tragedies, while C. Immermann (better known as the author of the novel *Münchhausen*), Mosen, Laube, and G. Freytag, all have produced good dramatic pieces. Among the host of novelists who have endeavored to follow in the steps of the great leaders of the *Sturm-und-Drang* period, the majority do not require notice. J. P. Richter, the satirist and humorist, stands forth, however, apart from, and far above his compeers; and few novelists ever exerted so lasting an influence on the literature and mode of feeling of their compatriots as that which Richter exerted over the minds of the middle classes of Germany, during the close of the eighteenth and the early part of the nineteenth century. Among other writers of note, were De la Motte Fouqué, A. Hoffmann, and A. Chamisso, whose tendencies were to dwell on the mysterious agencies of nature, which they attempted to individualize, and bring into association with material forms, as in the *Undine* of the first, the fantastic tales of the second, and the *Peter Schlemihl* of the last named. C. Pichler, Spindler, H. Steffens, C. Gutzkow, Sternberg, W. Häring (imitator of Sir W. Scott), Hauff, Zschokke, admirable writer of *novelettes*, Hackländer, Ida v. Hahn-Hahn, Auerbach, Freytag, Gerstäcker, Gottschall, Spielhagen, and Paul Heyse all have in turn had wide popularity, and some of them not as novelists only.

But numerous as have been writers of poetic and dramatic literature during the past century in Germany, the tendency of the German mind has also been largely directed to science; and the immense impetus given by A. v. Humboldt's travels and observations, and by his *Cosmos* and *Views of Nature*, has been followed by the prosecution of the most profound researches in every department of physical and natural science, and by the appearance of a multitude of records of travel, among the more important of which, for example, are those of Martius in Brazil, Pöppig in S. America, Tschudi in Peru, Schubert in Greece, Lepisus and Brugsch in Egypt, Schomburgk in British Guiana, Gützlaff in China, Siebold in Japan, the three brothers Schlagintweit in the Alps and in Central Asia, Barth and Vogel in Africa, and Leichhardt in Australia. Of the many eminent Germans who by their labors have at once enriched the science of the

world, and enhanced the literary and scientific glory of their own country, the following are a few, in addition to writers above mentioned: in astronomy and mathematics, Bessel, Encke, Struve, Gauss, and Mädler; in natural sciences, and in medicine, J. Müller, Ehrenberg, Carus, Oken, Schleiden, Von Buch, Liebig, Kopp, Dove, Moleschott, Bischoff, Rose, Poggendorf, Erdmann, Gmelin, Gräfe, Vogel, Rokitansky, Wagner, Schönbein, Helmholtz, Dieffenbach, Steinthal, Virchow, Dubois-Reymond, Haeckel, Traube; in history and biography, Niebuhr, Leo, Duncker, Preuss, Böttiger, Varnhagen v. Ense, Pertz, Lappenberg, Pauli; in geography, ethnology, statistics, and travels, Berghaus, Petermann, Stein, Hübner, Klöden, Kohl, Bunsen, Ideler, Lassen, Unger, Zimmermann; in the history of languages, literature, and the fine arts, and on politics, Vilmar, Bouterwek, Kuno Fischer, Waagen, Heinsius, Heyse, Ludwig Geiger, Becker, Creuzer, Ernesti, Jacobs, Savigny, Eichhorn, Bülow, Ersch, Carrière, Koch, Kelle, Koegel.

The tendencies of contemporary German literature are as varied as ever. The younger writers, whether realists or idealists, with their eye on the classic past or the present with its social problems, have been largely influenced by the nature school of Zola, the pessimism of Ibsen and Tolstoi, although some of them have freed themselves from unhealthy trammels and are infusing new life into German thought. Ernst von Wildenbruch is a playwright of power, marred occasionally by melodramatic passages; Gerhard Hauptmann is the better poet, even if his plays are less artistically constructed—his sympathy with the sufferings of the common people is a leading trait. Sudermann is a daring and popular idealist, having developed from his early crude standpoint, while Max Halbe is a dramatist of promise and Ludwig Fulda, poet, dramatist, and translator of Molière and Rostand, is a conspicuous figure. In contrast to modern forms, the older epic is illustrated by Heinrich Hart's ambitious "The Song of Humanity" and Maria E. Della Grazie's *Robespierre.* There is no limit to the literary output in poetry, the drama, and fiction, but the really eminent names are limited.

Bibliography.—Geography.—Kutzen, *Das deutsche Land* (3d ed. Breslau 1880); R. Lehmann and A. Kirchhoff, *Forschungen zur deutschen Landes-und Volkskunde* (14 vols. Stuttgart 1885–1903, being continued); Partsch, *Mittel-Europa* (Gotha 1904); *Central Europe* (New York 1903); Penck, *Das deutsche Reich* (Wien 1887); Ratzel, *Deutschland* (Leipzig 1898); O. Richter, *Das deutsche Reich* (2d ed. Leipzig 1898); Neumann, *Das deutsche Reich in geographischer, statistischer usw. Beziehung* (2 vols. Berlin 1874); Neumann, *Ortslexikon des Deutschen Reichs* (4th ed. Leipzig 1903).

Geology.—Lepsius, *Geologie von Deutschland* (Stuttgart since 1889); H. Credner, *Elemente der Geologie* (9th ed. Leipzig 1902).

GERMANY.

Flora.—Drude, *Deutschlands Pflanzen-geographie* (Stuttgart 1896); Leunis, *Synopsis der drei Naturreiehe* (11 Botanik, 3 vols., Hannover 1883).

Fauna.—G. Jäger, *Deutschlands Tierwelt naeh ihren Standorten eingeteilt* (Stuttgart 1874); Brehm, *Tierleben* (3d ed. Leipzig); Leunis, *Synopsis* (1 Zoologie, 2 vols., Hannover 1883).

Language.—O. Behaghel, *Gesehiehte der deutsehen Sprache* (2d ed. Strassburg 1905); O. Behaghel, *Die deutsehe Spraehe* (2d. ed. Leipzig 1902); F. Kluge, *Etymologiseh es Wörterbueh der deutsehen Spraehe* (6th ed. Strassburg 1905); F. Kluge, *Von Luther bis Lessing* (4th ed. Strassburg 1904).

Literature.—G. Gervinus, *Gesehiehte der deutsehen Diehtung;* A. Koberstein, *Grundriss der Gesehiehte der deutsehen National Literatur;* K. Goedeke, *Grundriss zur Gesehichte der deutsehen Dichtung;* W. Wackernagel, *Geschiehte der deutsehen Literatur;* W. Scherer, *Gesehiehte der deutsehen Literatur;* R. Kögel, *Gesehiehte der deutsehen Literatur bis zum Ausgang des Mittelalters;* K. Francke, *History of German Literature.*

Government.—Arndt, *Das Staatsreeht des Deutsehen Reiehes* (1900); Below, *Territorium und Stadt* (1900); Daniel; *Deutsehland naeh seinen physisehen und politischen Verhältnissen gesehildert* (1895); James *The Federal Constitution of Germany* (1890); Kutzen, *Das Deutsche Land in seinen eharaktesistsehen Zügen und seine Beziehungen zu Gesehiete und Lubenden Mensehen* (1900); Whitman, *Imperial Germany* (1889).

Political Parties.—Bebel, *Klassenpolitik und Sozialreform* (1898); Bigelow, *History of the German Struggle for Liberty* (1905); Cohn, *Zur politik des deutschen Finanz-Verkehrs und Verwaltungswesens*(1905); Hasse, *Das deutsehe reieh als nationalstaat* (1904).

Judieiary.—Arnold, *The Maritime Code of the German Empire* (1900); Combes de l'Estrade, *Les monarchies de l'empire allemand; organisation eonstitutionelle et administrative* (1904); Morhain, *De l'empire allemand; sa eonstitution et son administration* (1886).

Edueation.—Bremen, *Die preussische Volkssehule* (1905); *Die sehulordnungen des Grosshertzogtums Hessen* (1903); Dornheim, *Volkssehäden und Volkssehule* (1904).

The literature on German Universities is recorded in the recent work of Erman and Horn, *Bibliographie der deutsehen Universitäten* (Leipzig 1904). The best books on German Universities are W. Lexis, *Die Universitäten im Deutsehen Reieh* (Berlin 1904), and Friedrich Paulsen, *Die deutsehen Universitäten und das Universitätsstudium* (Berlin 1902).

Army and Navy.—Deutschland, *Die Heere und Flotten der Gegenwart* (1903); Edmonds, *Handbook of the German Army* (1900); Ferber, *Organisation und Dienstbetrieb der Kaiserliehen Marine;* Brassey, *The Naval Annual;* Jane, *Fighting Ships* (1905–6).

Agrieulture.—*Jahrbücher für Nationalökonomie und*

Statistik (1905); *Deutsch-Nautischer Almanach. Illustrirtes Jahrbuch über Seeschiffahrt, Marine und Schiffban* (1905); Nauticus, *Jahrlrich für Deutschlands Seeinteressen* (1900).

Industries.—Blondel, *Lessor industriel et commercial du peuple allemand* (1900); Eberstadt, *Der deutsche Kapitalmarkt* (1901); Lair, *L'impérialisme allemand* (1902); *Statistisches Jahrbuch des Deutschen Reichs.*

History.—Bryce, *Holy Roman Empire;* Tout, *The Empire and the Papacy;* Armstrong, *Charles V;* Gardiner, *The Thirty Years' War;* Headlam's *Bismarck;* Tuttle, *History of Prussia;* Henderson, *Short History of Germany;* Georg Kaufmann, *Politische Geschichte Deutschlands im* 19. *Jahrhundert* (Berlin 1900); Theobald Ziegler, *Die geistigen und sozialen Strömungen des* 19. *Jahrhunderts* (Berlin 1899); Karl Lamprecht, *Zur jüngsten deutschen Vergangenheit* (Berlin 1902–04); Heinrich von Treitschke, several volumes of his essays and *Reichstagsreden*, and his *Politik* (ed. Max Cornicelius, Leipzig 1899–1901); W. G. Taylor, *Bismarck, or the Typical German* (Amer. Hist. Ass. Papers, vol. 5); Werner Sombart, *Sozialismus und soziale Bewegungen im* 19. *Jahrhundert* (Jena 1901); Friedrich Naumann, *Demokratie und Kaisertum, Handbuch für innere Politik* (Berlin 1906); Paul Liman, *Der Kaiser, ein Charakterbild Wilhelms* II (Berlin 1905); *Reden und Erlasse, Briefe und Telegramme Kaiser Wilhelms II* (ed. A. O. Klaussmann, Leipzig 1902); translations thereof by L. Elkind (New York 1904), by W. v. Schierbrand (New York 1903).

GERMEN, now always called OVARY: lowest and thickened part of the pistil (q.v.) of a flower; containing in its cavity the rudiments of the seeds, called *ovules* (q.v.) attached to the *placenta* (q.v.) often by *umbilical cords* (q.v.). There is often only one ovule in the germen; sometimes it consists of a number of *carpels* (q.v.), with one ovule in each; occasionally the cavity of the germen is divided into cells, each of these containing one, and often many ovules. Some plants bend their flower-stalks to the ground after flowering, press the germen into the ground, and ripen their fruit in the earth, as a species of clover (*Trifolium subterraneum*), and the ground-nut (*Arachis hypogœa*): see ARACHIS.

GER'MICIDES, agents used to destroy or to hinder the growth of microscopical forms of plant and animal life.

Germicides may be grouped under three general heads, those that act mechanically, those that destroy life by physical means, and those whose action is chemical. Inasmuch as each particular germ is an individual with its own particular characters, definite methods for its killing must be devised. Thus it is well known that quinine, for instance, is very active in destroying animal parasites, such as the malarial organism, but it is practically of no service in combating a large number of vegetable forms; and *vice versa*, many substances which are capable of

destroying plant germs are inefficient when applied to animals.

Of the physical agents, heat, light, cold, and electricity, heat is the most satisfactory. High degrees of temperature will destroy all forms of parasitic life. The animal forms succumb very readily to the influence of heat, and most of the plant parasites are destroyed by it; but whereas heat may be applied with great success as a germicide in general disinfection, it naturally cannot be used as a general agent on the body. The red-hot iron in the form of a galvanocautery, or a heated wire, makes a most efficient form of cautery to destroy the poison of dog-bite, or to destroy localized forms of tuberculosis, etc., but heat is thus limited in its application.

Cold is not an efficient germicide. Ordinary freezing temperature (32° F.) kills but very few forms of either plant or animal organisms. Even the extreme cold of liquid air does not kill bacterial spores.

Light, especially sunlight, is a very efficient germicide, but the exposure must be continued for an appreciable length of time. Sunlight is nature's great germicide. Within recent years the light given by the Röntgen ray (X-ray), by radium, polonium, thorium, and similar agents, has been used with great success in the treatment of certain parasitic skin-diseases, but whether the effects are due to any germicidal action of the light, or to a normal tissue stimulation, is not decided. It seems from experiments thus far recorded that these forms of light are not definite germicides. Various colored lights, particularly red and amber, are known to restrict the growth of certain forms of bacteria. They do not, however, destroy them. This principle is made use of in smallpox hospitals and similar institutions, but it does not seem that the results are sufficiently striking to base any general deductions thereon. Electricity is not an efficient germicide. The passage of electrical currents through water does not necessarily kill the bacteria contained therein, notwithstanding the many claims made by enterprising manufacturers of electrified water, said to be made germ-free by the electrical current. What the future may reveal along this line of experimentation it is impossible to prophesy, but thus far satisfactory evidence of the germicidal effects of electricity are lacking.

Chemical germicides are numerous, both for external and internal use, although intracellular germicides, or those that can be used within the tissues of the body, are much to be desired. The list of chemical germicides is enormous. Thousands of different agents have been used and these exhibit varying degrees of germicidal activity. As has already been said, each form of germ possesses its own powers of resistance, and each germicide its ability to kill in varying degrees of strength. The germicides in popular use are chlorinated lime, carbolic acid, creosote, alcohol, boracic acid, ammonia, formaldehyde, hydrogen peroxide, iodine and its preparations, mercury and its

preparations, volatile oils of cinnamon, mustard, peppermint, turpentine, pennyroyal, oxygen, quinine, salicylic acid and its derivatives. Of these for external use, for use in closets, in bedding, for linen, etc., carbolic acid in the percentage of 1 to 50 of water, formaldehyde in percentage of a teaspoonful of the 40 per cent. solution of the gas to a quart, bichloride of mercury in the proportion of 1 part to 1,000, are the most practical and convenient germicides. So far as is now known, quinine is about the only efficient chemical substance that can be used as an intracellular germicide. It has the singular property of poisoning the malarial parasites within the red blood-cell without poisoning the blood-cell itself, a selective property which most poisonous agents lack.

The great germicide of the human body, and the one that protects it in its various struggles with different forms of parasites is the blood-serum. This is a very efficient germicide, a full consideration of the action of which will be taken up under the heading of IMMUNITY. Consult: Buck, *Reference Hand-Book of Medical Sciences* (1902), article on *Germicides;* Harrington, *Practical Hygiene* (1901). See BACTERICIDE; BACTERIA; DISINFECTION; GERMS; IMMUNITY.

GERMICULTURE, n. *gër'mĭ-kŭl-tūr,* also *chûr:* artificial cultivation of bacteria or disease-germs for scientific research.

GERMINAL, n. *jër'mĭ-nal* [F. from L. *germen,* a germ]: name given 1793, Oct., by the French convention to the seventh month of the republican year. It commenced on March 21, and was the first spring month.

GERM THEORY: one of the recent developments of scientific medicine, and now greatly influencing its practice. That minute forms of life, popularly called germs, can produce disease was thought of in the days of the early Greek philosophers. Aristotle had an inkling of the truth, but the subject has been a matter of speculation until the last 25 years; it is now unquestioned truth.

The steps that have led up to the accurate conception of this idea have been gradual and interesting. The first step consisted in the discovery that minute forms of life, bacteria and yeasts, produced fermentation of various kinds, also that bacteria were the chief agents of putrefaction. This advance was made mainly through the researches of Pasteur and Tyndall.

The second important step was the devising of methods by which these microscopic organisms could be separated and obtained in pure culture, so that experimenters might know definitely what particular kind of organism was being used in their observations. Such methods were found by Robert Koch of Berlin; they consisted in the using of solid media such as potato, gelatin, and agar-agar, a Japanese kind of gelatin, instead of the liquids previously used for the growth and cultivation of these bacteria. By means of solid media it became

possible to isolate the different varieties of bacteria and cultivate each separately.

It had been held for some time that certain forms of vegetal life known as bacteria could produce disease, and when Koch brought forward his methods about the year 1882, it became possible to prove the truth of these ideas. He laid down a series of laws which have been called Koch's laws. They are substantially as follows:

(1) In case of a disease which is supposed to be caused by some form of microorganism, this microorganism must always be found.

(2) When found it must be capable of being isolated and grown in pure culture.

(3) On being inoculated into another animal or plant capable of having the disease, this organism must produce the disease.

(4) It must again be recovered from the animal or plant so diseased, and again obtained in pure culture.

This completes the chain of evidence, and this proof is forthcoming for a large number of diseases.

In man there are a number of diseases in which the bacteria causing them are known. Such, for example, are diphtheria. tuberculosis, typhoid fever, pneumonia, cholera, lock-jaw, anthrax, relapsing fever, influenza, erysipelas, the Bubonic plague, glanders, actinomycosis, etc. To the science of bacteriology the world looks more than to any other department of medicine for all new knowledge of the origin and prevention of disease.

Bacteria are not the only forms of microorganisms that can cause disease. A number of parasitic skin-diseases are caused by low forms of plant life, the fungi, called moulds; and hundreds of thousands of dollars are lost every year on fruits and vegetables because of these fungus pests. The number of plant-diseases caused by fungus parasites is legion.

Still further there are low forms of animal life (Infusoria) that can cause disease in man and in other animals. Malaria is due to a minute form of animal life, the *Plasmodium malariæ*, and a form of dysentery is due to an ameba belonging to the same class of infusoria. A number of peculiar skin-diseases are known to have similar causation, and it is believed by some observers that cancer is caused by some such kind of organism.

How do these minute parasites produce disease? In the case of the fungus diseases of plants the explanation is evident. The parasites are robbers and take from the stem or leaves the food needed by the plant. But it is distinctly different with the bacteria and the diseases of mankind. Here the facts are more intricate, and they still remain involved, though some principles are definitely known. Bacteria have the property of making new compounds from their food-supply: this is evidenced by familiar facts of fermentation. As bacteria grow in the human body, or outside of it in some albuminous food, they form a series of these compounds of which a large class have cer-

tain peculiar chemical characteristics; these have been called ptomains (q.v.). Very many of these ptomains are innocuous, in fact the greater number of them; but certain ones called toxins are poisonous, and some to an exceedingly marked degree.

The symptoms of disease are due in great part to these toxins. Thus the typhoid bacillus produces as it grows the typhotoxin, and this causes the symptoms of the disease. A number of these toxins have a chemical composition resembling the albuminoid bodies; these have been called toxalbumins: the poisons of bacillus tuberculosis, of diphtheria, and of tetanus are of this character. Thus these diseases and many others are caused by the bacteria and their products, the toxins or the toxalbumins.

GEROCOMY, n. *jĕ-rŏ'ko-mĭ* [Gr. *gerōn*, an old man; *komeō*, I take care of]: branch of medicine which treats of the proper regimen for old people.

GÉRÔME, *zhā-rōm'*, JEAN LÉON: eminent French painter: b. Vesoul, 1824, May 11; d. Paris 1904, Jan. 10. Having received his early education at Vesoul he went to Paris in his 17th year, and entered the studio of Paul Delaroche, at the same time attending the School of the Fine Arts. In 1847, one of his pictures was exhibited at the Louvre; 1853 and 56, he travelled in the East; 1855, he received the cross of the Legion of Honor; 1863, he was appointed prof. of painting in the School of the Fine Arts. Gérôme was decorated with the Prussian order of the Red Eagle 1869, and made commander of the Legion of Honor. In 1855, his first great picture, *Le Siècle d'Auguste et la Naissance de Jésus-Christ* was exhibited; it was much canvassed by the critics, on the whole was received with favor, and ultimately was purchased by the state. In 1859, he exhibited his noble picture of Roman gladiators in the amphitheatre, with the motto: *Cæsar, ave, Cæsar Imperator, morituri te salutant*, which raised to the highest pitch his reputation as a colorist and painter of the human figure. With *Phryne before her Judges*, exhibited 1861, he won fresh honors as colorist and draughtsman. In the same year, he exhibited, with other pictures, *Socrates searching for Alcibiades at the House of Aspasia, The Two Augurs*, and a portrait of Rachel. Among his best known subsequent works are *Louis XIV. and Molière, The Prisoner*, and the *Death of Cæsar*. Gérôme has painted admirably several Eastern subjects. His mural picture, *The Plague at Marseille, Death of St. Jerome, Lioness meeting a Jaguar, Rex Tibicen* (1874), and *L'Eminence Grise* (1874), received high encomiums. Though not to be ranked among painters of the first class, historically, he took a foremost place among his contemporaries as a colorist, and as a spirited and elegant figure painter.

GERONA, *ċhā-rō'nâ:* province of Spain, in Catalonia; bounded by France, the Mediterranean, and the provinces of Barcelona and Lérida; 2,272 sq. m.; cap. Gerona. The surface is irregular, with branches of the Pyrenees, be-

tween which are many fertile valleys, and is chiefly drained by the Ter and the Fluvia rivers. Fishing and shipbuilding employ the people on the coast and agriculture and cattle raising in the interior. Pop. about 300,000.

GERONA, *ċhā-rō′nâ* (anc. *Gerunda*): capital of the Spanish province of Gerona; at the confluence of the Ter with its affluent the Oñar, 60 m. n.e. of Barcelona. It consists of an old and new town, the latter irregularly built on the declivity of a rocky hill, but highly picturesque, and containing a beautiful and lofty Gothic cathedral (commenced 1316), approached by a superb flight of steps. There are 5 other churches and 12 convents. The inhabitants manufacture paper, soap, and leather; and they do spinning and weaving. The city is protected by high thick walls, and 4 forts. —Gerona was of Roman origin, and was formerly the residence of the kings of Aragon. It has suffered much from sieges, of which the most noteworthy was that of 1809, when the French with 35,000 men encompassed and assailed the town. The besieged, unprovided with everything, even with ammunition, maintained a defense for seven months and five days against seven open breaches, and were forced to capitulate only when their heroic governor was struck down by famine and disease. Pop. 15,000.

GERONIMO, *jĕ-rŏn′ĭ-mō*, Apache chief of the Chiricahua band. In 1884–6 he became noted as the ring-leader in the harrying of Arizona and New Mexico. Gen. Crook forced him to a stand 1886, March 25, but Geronimo refused to surrender except for two years, the band to be sent East with their families and then replaced on the old reservation. Crook accepted the terms and started for Fort Bowie, but on the march the entire band slipped away to the mountains and began the old forays again. The subsequent criticism of Crook, as the Indians' dupe against the protests of the settlers, caused his replacement by Gen. Nelson A. Miles, who gave the Indians no rest, till Geronimo once more surrendered, this time on condition of being sent out of Arizona. Gen. Miles ordered them sent to St. Augustine, but Geronimo and 14 others were sent to Fort Pickens, Fla. He was later removed to Ft. Sill, Okla., where he died Feb. 17, 1909, aged ninety.

GERONTES, n. *gĕ-rŏn′tēz* or *jĕ-rŏn′-tēz* [old men—from Gr. *gerōn*, an old man]: in *Gr. antiq.*, magistrates in Sparta, not eligible till 60 years of age, who, with the ephors and kings, had supreme power in the state.

GERONTOCRACY, n. *jĕr′ŏn-tŏk′ră-sĭ* [Gr. *gerōn*, or *geronta*, an old man; *kratĕō*, I rule over]: the government or influence of old men or elders.

GEROPIGIA, *jĕr-ō-pĭj′ĭ-a*, or JERUPIGIA, *jĕr-ū-pĭj′ĭ-a:* unfermented grape-juice, with brandy and sugar sufficient to keep it from fermentation, and colored with (probably) extracts of rhatany-root and logwood. Within 25 years, a considerable quantity has been exported from Portugal, and used for giving a spurious strength and color to red wines, especially to those intended for exportation—the

factitious compound being mixed or vatted with the wines in bond. At least 20,000 gallons are now brought annually into Britain.

GERRY, *gĕr'ĭ*, ELBRIDGE, LL.D.: 1744, July 17—1814, Nov. 23; b. Marblehead, Mass.: statesman. He graduated at Harvard College 1762, engaged in mercantile business in his native town, and through industry soon acquired a considerable fortune. In 1772 he was elected member of the Mass. legislature, served there on the committees of safety and of supplies, was elected delegate to the Continental congress 1776, Jan., signed the Declaration of Independence, gave special attention to naval operations during the revolution, was chairman of the committee on the treasury till 1780, when the treasury board was organized with him as presiding officer, aided in preparing the Federal constitution 1787 but declined to sign it, and served in congress 1776–85 and 1789–93. In 1795 he retired to private life in Cambridge; 1797 accompanied Pinckney and Marshall on a special mission to France; 1798, 1801, 1812 was defeated as anti-Federalist candidate for gov.; 1810, 11 elected gov. of Mass.; and 1812 elected 5th vice-pres. of the United States, which office he held till his death.

GERRY, ELBRIDGE THOMAS, American lawyer and philanthropist: b. New York 1837, Dec. 25. He was graduated from Columbia in 1857, was admitted to the bar in 1860, and was a member of the State constitutional convention of New York 1867. Subsequently he became an associate of Henry Bergh in the American Society for the Prevention of Cruelty to Animals, of which he was for many years vice-president. In 1874 he was the leading organizer of the Society for the Prevention of Cruelty to Children, of which he was the president in 1876–91, and which became so closely identified with his name as often popularly to be termed the Gerry Society. He was chairman of the commission on capital punishment which substituted execution by electricity for that by hanging, in New York State (1886–8). He also held many important offices of trust, and became known for his interest in yachting affairs, having been commodore of the New York Yacht Club in 1886–93. He is a grandson of Elbridge Gerry (q.v.).

GERRYMANDER, *gĕr'ĭ-măn-dĕr:* arrangement of the political divisions or districts of a state so that in an election one party may obtain an advantage over its opponent, even though the latter may have a majority of the votes in said state. The term is derived from the redistricting of Mass. under Gov. Gerry 1812. For several years the democratic and federal parties had been about equal in strength in that state. That year the democrats had a majority in the legislature, and passed a bill to change the boundaries of the districts, that those sections which had given a large number of federal votes might be brought into one district. The bill was signed by Gov. Gerry, the state redistricted according to its provisions, and in the next election the

democrats carried every office in the state though the returns showed that nearly two-thirds of the voters were federalists. Gov. Gerry, on his accession to office, had replaced all civil officers in the state with adherents of his own political party, which caused a great opposition outcry; and after he had signed the redistricting bill his name was utilized in the popular name for the peculiar operation, though it has been claimed that he had no hand in framing the bill.

GERS, *zhär:* department in s.w. France, formed of portions of the old provinces of Gascony and Guienne. The dept. of Landes intervenes between it and the Bay of Biscay, and that of Hautes-Pyrénées between it and the frontiers of Spain. It has 2,420 sq. m.; capital, Auch. The surface toward the s. is mountainous, covered with ramifications of the Pyrenees, which extend northward in parallel lines. These lines decrease in height as they advance, and are separated by fan-shaped valleys, which are only a few yards wide in the s., but expand to a width of several m. in the n. of the department. The principal rivers are the Gers—which gives its name to the dept.—the Losse, the Baise, the Arratz, the Gimone, and the Save. The climate is healthful and temperate. The soil is a stiff loam, resting on thick layers of clay, and only moderately productive. More than half of the surface is used for agriculture, one-seventh is in vineyards, and the rest in meadows, heaths, and forests. Wine is produced in considerable quantity, but of inferior quality; much of it is converted into Armagnac brandy, which, after Cognac, is esteemed the best. The manufactures and exports are inconsiderable. Pop. about 250,000.

GERSON, *zhĕr-sōng′*, Jean de (proper name, Jean Charlier, but named from the place of his birth): 1363–1429; b. Gerson, in the diocese of Rheims: eminent scholar and divine. He was educated in the Univ. of Paris, under the celebrated Peter d'Ailly. Here he rose to the highest honors of the university, and ultimately to its chancellorship, having acquired by extraordinary learning the title 'The Most Christian Doctor.' During the unhappy contests which arose out of the rival claims of the two lines of pontiffs in the time of the Western Schism, the Univ. of Paris took a leading part in negotiations for union; and Gerson—as one of the most active supporters of its proposal to end the schism by the resignation of both the contending parties—visited the other universities to obtain their assent. But though he had the satisfaction to see this plan prevail in the council of Pisa, it failed to secure the desired union. In a treatise inscribed to his friend D'Ailly, he renewed the proposal that the rival pontiffs (now not two, but three since the election of John XXIII. at Pisa) should be required to resign; and in the new council at Constance 1414, he was again the most zealous advocate of the same expedient. To him, also, the great outlines of the plan of church reformation, then and afterward proposed, are due.

But his personal fortunes were marred by the animosity of the Duke of Burgundy and his adherents, to whom Gerson had become obnoxious, and from whom he had suffered much persecution, for the boldness with which he had denounced the murder of the Duke of Orleans. To escape their vengeance, he was forced to become an exile; and he retired from Constance, in the disguise of a pilgrim, to Rattenberg in Bavaria, where he composed his celebrated work *De Consolatione Theologiæ*, in imitation of that of Boëthius, *De Consolatione Philosophiæ*. It was only after several years that he was enabled to return to France, making his residence in a monastery at Lyon, of which his brother was the superior. He devoted himself in this retirement to works of piety, to study, and to the education of youth. His works, among the most remarkable of the age, filled five vols. in folio. Among the books formerly ascribed to him was the celebrated spiritual treatise *On the Imitation of Christ;* but it is no longer doubtful that he was not its author, and probable that it is the work of Thomas-a-Kempis: see KEMPIS. The authority of Gerson is much relied on by the advocates of Gallican principles; but the Ultramontanes allege that the principles laid down by him as to the limitation of the authority of the pope by a general council are applicable only to the exceptional case in which he wrote —viz., that of a disputed succession, in which the claim of each of the rival popes, and therefore of the existing papacy itself, was doubtful. Gerson openly denied papal infallibility, revolted from scholasticism, was a nominalist in philosophy, and followed in theology the method of a devout subjective mysticism.

GERSTÄCKER, *gĕr'stĕk-ĕr*, FRIEDRICH: 1816, May 16, —1872; b. Hamburg: German novelist and traveller. In 1837, he went to America; spent some months in New York, then wandered through the United States, sometimes as a stoker or sailor in various steam-packets, sometimes as silversmith, woodcutter, maker of pill-boxes, etc., working till he had earned money enough to enable him to proceed. For a time he led a wild adventurous life as a hunter in the forests. In 1842, he set up a hotel at Point Coupée, La.; but in 1843, a strong desire to see his friends induced him to return to Germany. Here he published his admirable *Streif- und Jadgzüge durch die Vereinigten Staaten Nordamerikas* (2 vols., Dresden 1844). This was followed by his *Die Regulatoren in Arkansas* (3 vols., Leip. 1846), *Die Flusspiraten des Mississippi* (3 vols., Leip. 1848), *Mississippibilder, Licht- und Schattenseiten transatlantischen Lebens* (2 vols., Dresden 1847), and *Amerik. Wald- und Strombilder* (2 vols., Leip. 1849). In his popular writings, as the *Reisen um die Welt* (6 vols., Leip. 1847), and *Der Deutschen Auswanderer Fahrten und Schicksale* (Leip. 1847), Gerstäcker contrives to rivet the attention even of the uneducated. In 1862, he accompanied Duke Ernest of Gotha on his travels in Egypt and Abyssinia; and on his return lived some time in Gotha. In 1867–8, he undertook

the longest journey of his life, visiting N. America, Mexico, Ecuador, Venezuela, and the W. Indies; and published, 1868, *Neue Reisen,* in which he gives a vivid account of them. As to novels, he published among others, *Eine Mutter,* 1867; *Die Missionäre,* 1868; *Die Blauen und die Gelben,* 1870; *In Mexico*; *In Amerika*; *Herrn Mahlhuber's Reiseabenteuer* (3d ed. 1871).

GERSTER-GARDINI, *gĕr'stėr-gâr-dē'nē,* ETELKA (ADELAIDE): prima donna; b. Kaschau, Upper Hungary, 1856. At an early age she gave evidence of unusual musical abilities, and by the advice of the director of the Vienna Conservatory, who had heard her sing, she studied with Mme. Marchesi 1873–76. She made her appearance first in Venice as Gilda in *Rigoletto,* 1876, Jan.; then sang in Berlin, Buda-Pesth, St. Pētersburg, Moscow, and London; came to the United States with the Mapleson English Opera Company 1877; and sang through several seasons in the large cities. She married Signor Gardini, her first director, and is at the head of a singing-school in Berlin.

GERUND, n. *jĕr'ŭnd* [L. *gerun'dĭŭm,* a gerund; *gerun'dŭs,* that which is to be done or carried on—from *gero,* I bear, I carry]: in *Latin gram.,* a kind of verbal noun; a part of the Latin verb which, according to grammarians, declares that anything is to be done. Thus the gerund of *scribo,* I write, is *scribendum;* as, *charta utilis ad scribendum,* paper useful for writing. As a sort of verbal noun, it has the same power of government as its verb, but is hardly ever found in the nominative, at least as a governing word. In *French,* the infinitive has almost entirely supplanted the gerund, the sole surviving remnant, we believe, being found after the preposition *en,* as *en attendant.* In *English,* the present participle does duty also for the gerund; as, he is *reading* novels (participle); he amuses himself with *reading* novels (gerund). GERUNDIAL, a. *jĕ-rŭn'dĭ-ăl,* pertaining to or resembling a gerund. GERUNDIVE, n. *jĕ-rŭn'dĭv,* in *Latin verbs,* the future participle passive; perhaps more strictly, 'a passive verbal adjective': ADJ. pertaining to or resembling a gerund; gerundial. GERUN'DIVELY, ad. *-lĭ.*

GERU'SIA: see GERONTES.

GERVAISE, *zhĕr-vāz',* OF CANTERBURY: born abt. 1150; d. prob. soon after 1200: monk and historian. Of his early life and education nothing is known, excepting that he was attached to the priory of Christ Church, Canterbury, and saw the burning of the cathedral 1174. His writings comprise an account of the burning and rebuilding of the cathedral (abt. 1184): a chronicle of clerical disputes during the episcopate of Baldwin (1185–90); *Chronica de tempore regum Angliæ, Stephani, Henrici II., et Ricardi I.,* extended to 1199; *Vitæ Dorobornensium Archiepiscoporum,* closing 1191; an unpublished MS., in the library of Corpus Christi College, Cambridge, entitled *Mappa Mundi;* and an English chronicle covering the period from the age of fable to the death of Richard.

GERVAS, *jėr'vas* (*Stachytarpheta Jamaicensis*): small shrub of nat. ord. *Verbenaceæ*, native of the W. Indies and warm parts of America. It has scattered hairy branches, oblong-ovate coarsely and sharply serrated leaves about two inches long, and long dense spikes of lilac flowers. It is regarded as a stimulant, febrifuge, anthelmintic, and vulnerary; a decoction of the leaves is applied to severe contusions; and the dried leaves are used as tea. In Austria, they are sold under the name of *Brazilian Tea*. In some countries they are used only for adulteration of tea; but for this purpose they are perhaps more used than any other leaf.

GERVASE, *jėr'vas* (or GERVAISE, *zhĕr-vāz'*), of TILBURY: English historian of the 13th c.: b. at Tilbury, in Essex; d. abt. 1218. He is said to have been nephew of King Henry II. About 1208, he was received with great distinction at the court of Otho IV., Emperor of Germany, and appointed by that monarch marshal of the kingdom of Arles. He wrote a commentary upon Geoffrey of Monmouth's History of Britain, entitled *Illustrationes Galfridi Monemuthensis*, lib. iv.; a History of the Holy Land (*Historia Terræ Sanctæ*); a treatise, *De Origine Burgundionum;* and a History of the Kings of England and France, comprised in a work entitled *Otia Imperialia*, libri tres; known also under the titles, *Mappa sive Descriptio Mundi* and *De Mirabilibus Orbis*. MSS. of the *Otia Imperialia* are preserved in the Cottonian Collection, and in the library of Corpus Christi, Cambridge. Nicolson ascribes to Gervase the Black Book of the Exchequer (*Liber Niger Scaccarii*), but Madox, who published a very correct edition of that work, makes Richard Nelson, Bishop of London, the author.

GERVILLIA, n. *jėr-vĭl'lĭ-a* [from M. *Gerville*, French naturalist]: in *paleon.*, genus of conchiferous mollusks, family *Aviculidæ* (wing-shells). Thirty-seven species are known, from the Carboniferous period to the Chalk.

GERVINUS, *gĕr-vē'nûs*, GEORG GOTTFRIED: 1805, May 20—1871, Mar.; b. Darmstadt: historian of German literature, and politician. He received a mercantile education, and was employed by a merchant in his native town. By diligent self-instruction he supplied what was wanting in his school-education, and 1826 was ready to enter the Univ. of Heidelberg. After completing his studies, he became teacher in an educational institution at Frankfort-on-the-Main. In 1835 he was appointed prof. extraordinary at Heidelberg. Previously he had published *Geschichte der Angelsachsen im Ueberblick* (Frank. 1830), followed by his *Historische Schriften* (Frank. 1833). In 1836, he was appointed ordinary prof. of history and literature at Göttingen. He had now begun to publish *Geschichte der Poetischen Nationalliteratur der Deutschen* (3 vols. Leip. 1835–38). This was followed by the *Neuere Gesch. der Poetischen Nationalliteratur der Deutschen* (2 vols. Leip. 1840–42). These two works were afterward published together under

the title *Gesch. der deutschen Dichtung* (5th ed. 1871). In 1837, he was one of the Göttingen professors who signed the famous protest against the abolition of the Hanoverian constitution, in consequence of which he lost his chair, and was ordered to leave the country within three days. He went first to Darmstadt, then to Heidelberg, and in the spring of 1838, to Italy. He spent the winter in Rome, engaged in historical studies. In 1844, he was appointed honorary prof. in the Univ. of Heidelberg. From this period his career was that of a political writer. Constitutional liberty was the object for which he ardently labored. His pamphlets and writings in different periodicals exercised very great influence over the national mind. In 1847, July, he, with some others, established the *Deutsche Zeitung* in Heidelberg, to advocate the political views of the constitutionalists. In 1848, he was deputed to attend the diet in behalf of the Hanse towns, and was elected a member of the national assembly by a district of Prussian Saxony. After the failure of the national democratic party in Germany, Gervinus returned to literary pursuits, the fruits of which are his suggestive work on Shakespeare (4 vols., Leip. 1849–50) and *Geschichte des 19ten Jahrhundert* (Leip. 1853–66). *Händel und Shakespeare* appeared 1868, and *Händels Oratorientexte* 1873.

GERYONIA, n. *gĕr-ĭ-ŏn′ĭ-ă* from *Geryon*, a three-headed monster in class. myth.]: in *zool.*, a typical genus of *Geryonidæ*, family of *Discophora*, or *Medusas* (jelly-fishes or sea-nettles).

GESENIUS, *ʒė-sē′nĭ-ŭs*, Ger. *gā-zā′nē-ûs*. Friedrich Heinrich Wilhelm: 1785, Feb. 3—1842, Oct. 23; b. Nordhausen, Prussian Saxony: great modern German Orientalist and biblical scholar. He studied first at the gymnasium of his native town, afterward at the universities of Helmstedt and Göttingen. After teaching in the pædagogium at Helmstedt, he became 1806 a theological *Repetent* in Göttingen; and 1809, on the proposal of Johann von Müller, was appointed prof. of anc. literature in the gymnasium of Heiligenstadt. In 1810, however, he received a call to Halle as extraordinary prof. of theology, and was made an ordinary prof. 1811. 1810–12, he published, in two vols., *Hebrew and Chaldee Dictionary of the Old Testament*, which underwent improvements in several subsequent editions, after he had made a journey to Paris and Oxford in the summer of 1820, for researches in the Semitic languages. In the two years following the publication of this Dictionary, appeared his *Hebräisches Elementarbuch* (2 Bde., Halle, 1813–14), consisting of a Hebrew grammar and reading-book. This work, as it has been improved in the recent editions of Gesenius's distinguished pupil and literary executor, Professor Rödiger of Halle, and the lexicon above mentioned, are still the grammar and dictionary of the Old Testament most in use in Germany, Great Britain, and America. The best English translations of the dictionary founded on the Latin edition are those of Robinson (Ameri-

can), and of Tregelles (British); the best of the grammar are those of Davies (London), and of Connat (New York). In 1815, another work was published by Gesenius on the history of the Hebrew language (*Kritische Gesch. d. Hebr. Sprache u. Schrift* Leip.). and a treatise, *De Pentateuchi Samaritani Origine, indole et auctoritate* (Halle). Besides a translation of Isaiah with a commentary in three vols. (Leip. 1820–1), we are indebted to Gesenius for a larger Hebrew Grammar (*Grammatisch-kritisches Lehrgebäude d. Hebr. Sprache*, 2 Bde., Leip. 1817), as well as for a larger lexicographical work (*Thesaurus philologico-criticus Linguæ Hebraicæ et Chaldaicæ Veteris Testamenti*), of which the first part was published 1829, but which was completed only in 1858 by Prof. Rödiger. Gesenius contributed papers on Oriental Antiquity to Ersch and Gruber's *Allgemeine Encyclopädie;* and his notes to the German translation of Burckhardt's *Travels in Syria and Palestine*, throw light on many points of biblical geography. A memorial of him appeared in the year after his death (*Gesenius, eine Errinnerung an seine Freunde*, Berlin 1843).—Many of the results of the rationalizing method of interpreting the Old Testament which characterizes all the works of Gesenius, have not stood against the progress of biblical science, and he has certainly been surpassed by Ewald in insight into the genius of the Hebrew language, and its bearing on the interpretation of Hebrew life and thought, as well as in all that qualifies the critic for a true historical, æsthetical, and religious appreciation of the literature preserved in the Old Testament. Yet his intense devotion to his favorite studies, and the advance which he made beyond all his predecessors in the establishment of more certain principles of Hebrew philology, entitle him to be regarded as having constituted a new epoch in the scientific study of the Old Testament.

GESH, n. *gēsh*, or GEES, n. *gēz* [probable corruption of *Cuth*]: the sacred and anc. language of Ethiopia and Abyssinia; the modern language of Abyssinia is called *Amharic*.

GESNER, *gĕs'nėr*, KONRAD VON: 1516–1565, Dec. 13; b. Zürich: Swiss naturalist. His father, a leather-seller, was too poor to pay for more than the first years of his education at the town-school; but John Jacob Ammianus, prof. of Latin and oratory in the college, saw in the boy so much promise that he took him into his house and instructed him gratuitously for three years in Latin, Greek, dialectics, and oratory. He subsequently studied three or four years at Paris, whence he was summoned back to Zürich, to become a teacher in the school in which he had begun his studies as a child. He applied all his spare time to the study of medicine and botany, in the hope of ultimately rising to the office of a professor. The hope was gratified on the opening of the Univ. of Lausanne, when he was appointed prof. of Greek. After holding the office three years, he went to Montpellier, where he attended medical lectures, and to Basel, where, after additional study, and

the usual disputations, he was admitted to the degree doctor of medicine. At the age of twenty-five he returned to his native town, and soon received the appointment of prof. of philosophy, which he held until his death. He likewise practiced medicine, and published from time to time the fruit of his studies. As, in the course of his life, he published no less than 72 works, besides leaving at his death 18 in progress, only a few of the most important can here be noted. His first great work, *Bibliotheca Universalis*, appeared when he was only 29 years old. It contained the titles of all the books then known in Hebrew, Greek, and Latin, with criticisms and summaries of each; and as an index to authors who wrote before 1545, it remains to this day very valuable. Ten years later (1555), *Mithridates, de Differentiis Linguarum* appeared, containing histories of 130 ancient and modern languages. But by far the greatest of his literary works was *Historia Animalium*, planned in six books, of which only four were completed: in this work, a monument of industry, he aimed at bringing together all that was known in his time concerning every animal. These four volumes entitle their author to the designation, 'the German Pliny.' Botany was probably the section of natural history with which he had the greatest practical acquaintance. He had collected more than 500 plants undescribed by the ancients, and was arranging the results of his labors in this department at his death in Zürich, of the plague. He appears to have been the first who made the great step toward a scientific classification of distinguishing genera by a study of the fructification.

GESNERA, n. *jĕs'nėr-a* [from Conrad *Gesner*, botanist]: typical genus of *Gesneraceæ*, gesnerworts.

GESNERACEÆ, *jĕs-nėr-ā'sē-ē:* natural order of exogenous plants, allied to *Scrophulariaceæ*, consisting of herbaceous plants and soft-wooded shrubs, generally tropical or sub-tropical. They frequently spring from scaly tubers. The leaves are wrinkled and destitute of stipules. The calyx is 5-parted; the corolla, tubular, 5-lobed, more or less irregular. The stamens are generally four, two long and two short, with the rudiment of a fifth. The germen is half inferior, surrounded at its base by glands or a fleshy ring; it is one-celled, and has parietal placentæ. The fruit is either a capsule or a berry, many-seeded.—There are about 120 species, exclusive of those sometimes formed into a distinct order under the name *Cyrtandraceæ* or *Didymocarpeæ*, of which there are about 140. The true *Gesneraceæ* all are natives of the warmer parts of America, where some grow on trees. The *Cyrtandraceæ* are more widely distributed.—Some plants of this order have mucilaginous and sweetish edible fruits; but it is chiefly remarkable for beauty of flowers, containing some of the most admired ornaments of hothouses, as species of *Gloxinia*, *Achimenes*, etc.

GESS'LER, Albrecht or Hermann (called also Gess-

LER VON BRUNECK): according to Swiss tradition, an Austrian gov. of the Forest cantons in 1300; see TELL, WILLIAM.

GESSNER, *gĕs'nėr*, SALOMON: 1730, Apr. 1—1787, Mar. 2; b. Zürich: German poet and artist. Apprenticed to a bookseller in Berlin 1749, he ran away and endeavored to earn a livelihood by landscape painting. From Berlin he went to Hamburg, where he became intimate with Hagedorn. On his return to Zürich, he published *Daphnis*, followed by *Inkle und Yarico*, a small volume of idyls, and *Tod Abels* (the Death of Abel), a species of idyllic heroic prose poem, which, though the feeblest of all his productions, is the best known. Later he became an excellent engraver.

GEST, n. *jĕst* [OF. *geste*, thing done, exploit: L. *gestus*, borne, carried on]: a deed; an act; a feat.

GEST, n. *jĕst* [F. *giste*, a lodging—from mid. L. *gista* or *gesta*, a sleeping-place]: in *OE.*, a lodging or sleeping-place; the appointed resting-place for the king on a royal progress; the roll in which these stages were written.

GESTA ROMANORUM, *jĕs'ta rō-mā-nō'rŭm:* oldest legendary work of the middle ages. The stories are in Latin, and mostly from the histories of the Roman emperors, or at least are referred to their period. Later, moralizing expositions were added, whence the work obtained the name *Historiæ Moralistæ.* The Gesta Romanorum belongs to that class of works with which the monks were wont to beguile their leisure hours, and which were appointed to be read in the refectory. The stories are short, and destitute of rhetorical ornament; neither have they any dialogues or tragic incidents. Their attractiveness lies in their naïveté and childlike simplicity, though their artless piety often passes into a deep mysticism. Down to the 16th c., the Gesta Romanorum was one of the most widely read books among the learned as is proved by the number of manuscripts and of printed impressions shortly after the invention of printing (the first was issued at Cologne 1472). It was early translated into French, English, German, and Dutch. The oldest Dutch translation was published at Gouda by Gerard Leeu 1481; the oldest German translation at Augsburg, by Hans Schobser, 1489. Among the older English translations was that by R. Robinson (Lond. 1577). In 1824 the Rev. C. Swan published *Gesta Romanorum, translated from the Latin, with Preliminary Observations, and Copious Notes.* The later German fabulists and novelists, such as Hans Sachs, Burkard Waldis, and others, made abundant use of this great storehouse. But soon after the Reformation it was thrown into the background, and even in the monasteries, where for a long time it maintained its footing, it was at length forgotten. Recently, however, amid the general revival of interest in the literature of the past, it has received special attention. Its author has been supposed by some to have been Petrus Berchorius or Bercheur

of Poitou, who died prior of the Benedictine Abbey of St. Eloi in Paris 1362, but it is now believed that he only added the moralizings; and Grässe, in an appendix to his German translation (2 vols., Dresd. and Leip. 1842), has shown that a certain Elinandus is the author or compiler of the work. This Elinandus was undoubtedly a monk, and was either an Englishman, or German. According to Oesterley, to whom we owe the first critical edition of the work (1872), the Gesta Romanorum took shape in England about the beginning of the 14th century.

GESTATION, n. *jĕs-tā'shŭn* [F. *gestation*—from L. *gestātĭōnem*, a bearing or carrying—from *gesto*, I bear or carry]: the act of carrying young in the womb from conception to delivery; the state of pregnancy. GESTATORY, a. *-tă-tėr-ĭ*, that may be carried or worn; pertaining to pregnancy.—The *period of Gestation*, in physiology, is the period that intervenes in the mammalia between impregnation and the bringing forth of the young. The period and the number of young produced at a birth vary extremely in different mammals, but usually stand in an inverse ratio to one another. Thus, in the larger herbivora, as, for example, the elephant, the horse, the ox, and the camel, the female seldom produces more than one at a time, but the period of gestation is long; while in the smaller ones the progeny is numerous, but the period of gestation only a few weeks. In the elephant, the period of gestation extends over 20 or 21 months; in the giraffe, it is 14 months; in the dromedary, it is 12 months; in the mare, more than 11 months; in the tapir, between 10 and 11; in the cow, 9; and in many of the larger deer somewhat more than 8 months. In the sheep and goat, the period is 5 months. In the sow, which produces a numerous litter, the period is 4 months. In the rodentia, the progeny is numerous and imperfectly developed, and the period of gestation is comparatively short; in the beaver, one of the largest of the order, it is 4 months; in the rabbit and hare, 30 to 40 days; in the dormouse, 31 days; in the squirrel and rat, four weeks; and in the guinea-pig, three weeks or less. The young of the carnivora, like the young of the rodentia, are born with their eyes closed, and in a very immature state; and in even the larger carnivora the period of gestation is far shorter than in the larger ruminantia or pachydermata: it is six months in the bear; 108 days in the lion (the period in this animal is stated by Van der Hoeven at three months); 79 days in the puma; 62 or 63 days in the dog, the wolf, and the fox; and 55 or 56 days in the cat. In the marsupial animals, which, from a structural peculiarity, produce their young in a far more immature state than any other mammals, the period of gestation is very short, being 39 days in the kangaroo, the largest of the marsupial animals, and only 26 days in the opossum. Nothing certain is known regarding the period of gestation of the cetacea. The quadrumana produce one, sometimes two, at a birth; and the period of gestation, as far as has been observed, seems to be seven months.

In the human race, 40 weeks is the usual period of gestation, but liable to certain deviations: See FŒTUS.

GESTICULATE, v. *jĕs-tĭk′ū-lāt* [L. *gesticŭlātus*, having made pantomimic gestures—from *gesticŭlus*, a mimic gesture: F. *gesticuler*, to gesticulate]: to make gestures or motions, as in speaking or attempting to speak; to play antic tricks. GESTIC′ULATING, imp. GESTIC′ULATED, pp. GESTIC′ULATOR, n. *-lā-tėr*, one who. GESTIC′ULA′TION, n. *-lā′shŭn* [F.—L.]: the act of making gestures to express passion or enforce sentiment; motions or postures of the body in speaking. GESTIC′ULA′TORY, a. *-lā′tėr-ĭ*, connected with or having the character of gesticulation.

GESTURE, n. *jĕs′tūr* or *-chûr* [mid. L. *gestūrā*, mode of acting—from L. *gestus*, posture, motion: F. *geste;* It. *gesto*, gesture]: motions of the body or limbs used to express forcibly ideas or passions, or to enforce an argument or opinion; any significant motion of the body or limbs. GESTURAL, a. *-tū-răl*, belonging to gesture. GES′TURELESS, a. *-lĕs*, free from gestures.

GET, v. *gĕt* [AS. *getan*, to get: Icel. *geta*, to conceive, to acquire: Goth. *bi-gitan*, to find, to obtain]: to procure; to obtain; to attain; to realize; to bring into a certain condition; to become; to beget. GET′TING, imp.: N. the act of obtaining or acquiring; acquisition; profit. GOT, pt. *gŏt*, did get. GOTTEN, or GOT, pp. *gŏt′n*, *gŏt*. GETTER, n. one who. To GET AHEAD, to advance; to prosper. To GET ALONG, to proceed; to advance; to prosper. To GET AT, to reach; to make way to. To GET AWAY, to leave; to escape. GET AWAY! begone! To GET BY HEART, to learn anything, as a lesson, so as to be able to repeat it from memory. To GET CLEAR, to escape; to be released or freed, as from confinement or danger. To GET DRUNK, to become intoxicated. To GET LOOSE, to disengage one's self. To GET OFF, to escape. To GET ON, to proceed; to advance; to prosper. To GET OUT, to extricate one's self; to escape. To GET OVER, to surmount. To GET QUIT or RID OF, to be freed from a disagreeable person or thing with difficulty or after effort. To GET THE DAY, to win. To GET THROUGH, to traverse; to finish. To GET TO, to reach; to arrive at. To GET TOGETHER, to assemble; to convene; to amass with effort. To GET UP, to rise from sleep or repose; to make ready or prepare, as a play; to perfect one's self, or make one's self competent in, as in a subject for examination.—SYN. of 'get': to acquire; gain; win; earn; procreate; generate; learn; induce; persuade; betake; carry.

GET, v. *gĕt:* a contraction for BEGET. GETTER, n. *gĕt′ėr*, one who begets.

GETÆ, *jē′tē:* people of Thracian extraction, who, when first mentioned in history, inhabited the country called Bulgaria. They were a warlike people, and long successfully resisted the attempts of Alexander the Great and Pyrrhus to subdue them. They afterward removed to the n. bank of the Danube, having the Dnieper as their bound-

ary on the e., while westward they encroached on the Roman empire, with which from this time they were continually at war. They were called Daci by the Romans, and their country Dacia, and are often mentioned in the literature of the Augustan era as savage and unconquerable foes. During the reign of Domitian, they overcame the Romans, and exacted an annual tribute. But in 106, their gallant king, Decebalus, was defeated by Trajan, and the people completely subdued. A Roman colony was settled in the country, and becoming incorporated with the Getæ, gave rise to a mixed race, the modern Wallachs.

GETHSEMANE, *gĕth-sĕm'a-nē* [Heb. *gath,* a wine-press, and *shemen,* oil]: scene of Christ's agony on the night before his Passion. It was a small farm or estate at the foot of Mount Olivet, a little more than half a mile from the city of Jerusalem. Attached to it was a garden or orchard, a favorite resort of Christ and his disciples. The spot pointed out to modern travellers as the site of the garden of Gethsemane corresponds sufficiently with the requirements of the Scripture narrative, and the statements of Jerome and Eusebius. It is a place about 50 paces square, inclosed by a low wall of loose stones, and contains eight very old olive-trees, regarded with pious superstition as having existed in the time of our Lord.

GETTY, *gĕt'ĭ,* George Washington: soldier: b. Georgetown, D. C., 1819, Oct. 2; d. 1901, Oct. 3. He graduated at the U. S. Milit. Acad. 1840; was promoted 1st lieut. 4th U. S. artill. 1845, Oct. 31; served through Mexican war and was brevetted capt. for gallantry 1847, Aug. 20; was engaged in the Seminole war 1849–50, 56–7, and the Kansas disturbances 1857–8; and became aide-de-camp and lieut. col. 1861, Sep. 28. In the civil war he commanded the artill. at Dobb's Ferry, 1861; Yorktown, Gaines's Mills, and Malvern Hill, 1862; was engaged at South Mountain, Antietam, and in the Rappahannock campaign 1862–3; promoted brig. gen. vols. 1862, Sep. 25; and brevetted col. U. S. A. for gallantry in the Wilderness, brig. gen. U. S. A. for Petersburg, maj. gen. vols. for Winchester and Fisher's Hill, and maj. gen. U. S. A. 1865, Mar. 13, for services during the war. He was appointed col. 37th U. S. inf. 1866, July 28, commanded the troops along the Baltimore and O. railroad during the labor riots 1877; retired 1883.

GETTYSBURG, (*get-iz-berg*) post-borough, cap. of Adams co., Penn.; on the lines of the Philadelphia and Reading, and Western Maryland railroads; 8 miles north of Mason and Dixon's line, 25 m. e. by s. of Chambersburg, 28 m. w. by s. of York, 45 m. s.w. of Harrisburg, 115 m. w. of Philadelphia; named from James Getty, who settled it 1780. It is the seat of Pennsylvania College (Lutheran), and of the Theol. Seminary of the General Synod of the Lutheran Church in the United States. Gettysburg is noted as the theatre of one of the

great battles of the civil war, fought in the town and the surrounding country 1863, July 1, 2, 3, and contains the Soldiers' National Cemetery, dedicated 1863, Nov., in which there are 3,629 graves. The whole battlefield has been included in a national park and contains a large number of monuments marking the various actions. G. was incorporated a borough 1806. Pop. (1910) 4,030. See GETTYSBURG, BATTLE OF.

GETTYSBURG, BATTLE OF: 1863, July 1, 2, 3, between the Confederate army of Northern Virginia under Gen. Robert E. Lee and the National army of the Potomac under Gen. George G. Meade. The Confederate army numbered about 76,000 men, infantry, and artillery, and was formed into three corps under Gens. Longstreet, Ewell, and A. P. Hill. The National army comprised 82,000 men, infantry, and artillery. Each army had a cavalry arm of about 11,000 men; but until the third day of the battle Gen. Lee had no use of his cavalry, as the commander, Gen. J. E. Stuart, had taken it all off on a scheme to ride round the Army of the Potomac. The movements leading to the series of battles began immediately after the battle of Chancellorsville 1863, May 2–4. Several raids into Md. and Penn. were made by the Confederates, and so little resistance was encountered that Gen. Lee determined to invade Penn. in force, spread terror through the north thereby, and fight the decisive battle of the war on northern soil. In accordance with this plan he left the shore of the Rappahannock early in May, and by a feint secured a week's march before Gen. Hooker, then commanding the army of the Potomac, became aware of his intentions. June 9th the Confederate columns encountered the National cavalry under Gen. Pleasanton at Beverly Ford; on the 13th Gen. Ewell reached Winchester, defeated Gen. Milroy, and crossed the Potomac; on the 21st and 22d he traversed Md., pushed forward into Penn., and sent Rodes's brigade toward Harrisburg and Early's to Columbia; and on the 27th Longstreet and Hill reached Chambersburg. In the mean time the Army of the Potomac, under Gen. Hooker, crossed the Potomac and headed toward Frederick City, Md. Hooker, seeing that Lee had left his communications exposed, decided to attack them without waiting for a general engagement, and called for 10,000 troops that were at Harper's Ferry and of no use there, but was refused. On this he resigned command, and June 28 Gen. Meade succeeded him. Neither of the commanders designed to meet the inevitable encounter at Gettysburg. Lee, fearing that his enemy would gain his rear and shut him in a hostile country, planned to concentrate his whole army as close as possible to the National army, and selected Gettysburg as the rendezvous or point of union. Meade, with the responsibility of checking the Confederate advance thrust so suddenly upon him, determined to establish a defensive position on Pipe Creek, 15 m. s.e.

of Gettysburg, and await attack. He ordered the occupation of the slope along Pipe Creek, pushed the 6th corps (right wing) toward Manchester, the 2d corps toward Taneytown, the 12th and 5th corps (centre) in a general n. direction, and the 1st, 3d, and 11th corps (left wing) toward Emmettsburg and Gettysburg. July 1 the Confederate Gen. Hill moved toward Gettysburg to dislodge the Union force there, and Gen. John F. Reynolds, in command, sent Gen. John Buford with cavalry from Gettysburg to check Hill's advance. The two forces met on Seminary Ridge w. of Gettysburg. Reynolds hastened with infantry to support Buford, and for a time held the advantage, but Hill soon threw forward other troops, Reynolds was killed, and the Confederates drove the Federals through Gettysburg to the hills south of the village. Meade, at Big Pipe Creek, heard the firing at Gettysburg, and sent Hancock to take command. The latter considered Gettysburg a better place for a general engagement, than the one first chosen, and in this opinion Meade after examination concurred. By daylight July 2, the greater parts of both armies were in position. The National army occupied the whole line of Cemetery Ridge, while the bulk of Lee's army was on Seminary Ridge, a mile westward and nearly parallel. Ewell's corps was at the foot of Culp's Hill, the northern end of Cemetery Ridge, which curves round to the east. Meade took command at noon, and the second battle was opened at 4 P. M., by the Confederates attacking the 3d corps, which had been pushed forward to an imperfect intermediate ridge. Its position here was not tenable, and after fierce fighting it was driven back to its true position in the main line. At the same time there was a stubborn contest for possession of Little Round Top, a position of great importance, which the National force gained and kept. The day closed without apparent advantage to either army. On the morning of the third day Meade assumed the offensive on his extreme right and drove Ewell's men from a position they had gained the day before. But the main fight opened at 1 P. M., the Confederates with 120 guns on Seminary Ridge engaging the Union batteries of 80 guns on Cemetery Ridge, preparatory to a grand charge intended to disrupt the National line at the centre. This tremendous cannonade lasted two hours. Then Lee ordered the charge by Gen. Pickett's division, to which were added brigades that brought the attacking force up to 15,000 men. In an instant all the Federal batteries opened upon the enemy, and as they advanced up the slopes in the face of the terrific cannonading, Meade hurried his troops from all sides and utterly routed the attacking force, hardly one in four escaping death. On the third day also there was a cavalry fight at each end of the line. On the Union right Gregg's cavalry division, aided by Custer's brigade, defeated Stuart, after a severe fight, and thwarted his attempt on Meade's right and rear. On the left Kilpatrick, with two cavalry brigades,

recklessly charged Confederate infantry in dense woods, and behind stone fences, west of Round Top, in which assault Gen. Farnsworth, commanding one of his brigades, was killed. On the morning of July 4 Lee withdrew from his advanced positions, put his trains in motion for the rear, retreated at night and, followed and harassed by the Union cavalry, reached Williamsport on the 7th; but as the pontoon bridges had been destroyed and the Potomac had risen, he was unable to cross, and so entrenched. Meade followed by a circuitous route through Frederick and, after some delay, again confronted Lee on the 13th. He was about to attack when Lee recrossed the Potomac on the night of the 14th, his rear-guard, under Gen. Pettigrew, being attacked by Kilpatrick, during which fight Pettigrew was mortally wounded and many prisoners were taken. From first to last the Union forces on the field numbered about 88,000 effective men; the Confederate forces on the field numbered about 73,000 men. The loss to the National army, in killed, wounded, and missing, was 23,190. The Confederate loss was not reported, but was estimated at about 30,000. Consult: Compte de Paris, *The Battle of Gettysburg;* Bates, *Battle of Gettysburg;* Doubleday, *Chancellorsville and Gettysburg;* Walker, *History of the Second Army Corps;* Powell, *History of the Fifth Army Corps;* The Century Company's, *Battles and Leaders of the Civil War.*

GEULINCX (*ge'lĭnks*, or *zhe-lănks'*), Arnold, b. Antwerp, 1625; d. Leyden, 1669. Studied philosophy and medicine at the University of Louvain, 1646–58; lectured most successfully on philosophy at Louvain, was then deposed and became a Protestant. Lived for some years in Leyden in great poverty. Rector, University of Leyden 1662; Professor Extraordinary 1665–69. An early disciple of Descartes. First systematically to develop Occasionalism. Descartes, accepting the existence of soul and body, does not explain their interaction. Geulincx taught that neither can immediately act on the other, since matter is extended without consciousness, and mind is conscious without extension. What, then, *causes* material and mental concomitant changes? Geulincx answers that matter is void of efficient causality, but that *on the occasion* of modification in mind God produces modification in matter and *vice versa*. Occasionalism teaches that God is the sole cause in the universe. Apart from God finite being has no reality, human thoughts, desires, volitions, are really God's.

GEUM, *jē'ŭm:* genus of plants of nat. ord. *Rosaceæ*, subord. The carpels are dry. *G. urbanum*, Common Avens, or Herb Bennett, is a herbaceous plant, one to two ft. high; *G. rivale*, called Water Avens, is about one ft. high; both species have the radical leaves interruptedly pinnate and lyrate, and the cauline leaves ternate, but *G. urbanum* has erect yellow flowers, and *G. rivale* has nodding flowers of a brownish hue. The former grows in

hedges and thickets, the latter in wet meadows and woods, and sometimes even in very alpine situations. Both are aromatic, tonic, and astringent, and are employed to restrain mucous discharges, and in cases of dysentery and intermittent fever. The root of *G. rivale* is used also in diseases of the bladder. The root of *G. urbanum*, when fresh, has a cloverlike flavor, which it communicates to ale; and for this purpose it is gathered in spring before the

Water Avens (*Geum rivale*).
a, carpel and awn; *b*, petal; *c*, stamen; *d*, pistil.

stem grows up. *G. Canadense*, the Chocolate Root or Blood Root of N. America, has some reputation as a mild tonic: it is much used in the United States in diseases of the bladder. It resembles in its leaves the two species above mentioned, and has erect flowers like *G. urbanum*. A number of other species are known, natives of temperate and colder regions of the northern and southern hemispheres.

GEWGAW, n. *gū′gaw* [OE. *gaud*, ornament: Swiss, *gugage*, an exclamation of contempt at senseless chatter: F. *joujou*, a plaything: comp. Gael. *geugach*, a little branch—*lit.*, trifling child's-play as opposed to work done with settled purpose]: a showy trifle; a toy; a bauble: Adj. showy, but of no value. *Note.*—The word may be a corrupt reduplication of AS. *gifan*, to give, as the prov. Eng. *giffgaff*, friendly interchange of benefits or favors.

GEY, a. *gī* [Icel. *gagn*, very]: in *Scot.*, very, as, 'gey sharp,' pretty or rather sharp.

GEYSER, or Geysir, n. *gī′zėr* [Icel. *geysa*, to gush, to be impelled—allied to Eng. *gush; geysilegr*, vehement]: eruptive thermal spring, or spouting fountain of hot water.

Gey′serite, n. *-zėr-īt*, loose, porous, hydrated form of

silica, deposited in concretionary cauliflower-like masses around such hot springs as the geysers.—*Geysers* are found in various parts of the world in evident connection with the volcanic forces at work below. The geysers in the Yellowstone Park in Wyoming bordering on Montana, are probably the most wonderful (see YELLOWSTONE PARK): but a group long famous is in Iceland, about 70 m. from Reikiavik, 16 m. n. of Skalholt, and within sight of the volcano of Hecla. On the slope of a low trap-hill, overlooking the wide grassy valley of the Whitae, or White river, a space of ground measuring about half a mile square, is thickly interspersed with boiling or hot springs of various sizes, from jets not greater than an overboiling tea-kettle, up to great caldrons, besides vestiges of others no longer in operation. All are surrounded by silicious incrustations, formed in the course of time by the minute charge of silica infused into the water. The chief apertures are two, respectively called the *Great Geyser* and the *Strokr* (i.e. Churn), little more than a hundred yards apart. The latter is an irregular aperture of six to eight ft. diameter, down which one may in general safely look, when he sees the water noisily working in a narrower passage about 20 ft. below. If, by throwing in a sufficient quantity of turf, he can temporarily choke this gullet, the water will in a few minutes overcome the obstruction, and, perform an eruption with magnificent effect, bursting up 60 ft. into the air, brown with the turf that has been infused into it, and diffusing steam in vast volumes around.

The appearance of the Great Geyser is considerably different. On the summit of a mount about 15 ft. above the surrounding ground, is a circular pool or cup of hot water, 72 ft. across at its greatest diameter, and about four ft. deep, entirely formed of silicious crust of dull gray color. At the edge, this water has been found to be 188° F.; in the centre, it is considerably hotter. From the centre descends a pit eight ft. wide and 83 ft. deep, up which a stream of highly heated water is continually but slowly ascending, the surplus finding its way out by a small channel in the edge of the cup, and trickling down the exterior of the crusty eminence. Every few hours, the water, with a rumbling noise, rises tumultuously through the pit, and jets for a few feet above the surface of the pool; soon it subsides, and all is quiet again. About once a day, however, this tumult ends in a terrific paroxysm, which lasts perhaps a quarter of an hour, during which the water is thrown in repeated jets 60 to 80 ft. high, mingled with such volumes of steam as obscure the country for half a mile round. If a visitor be tolerably near on the windward-side, he may catch glimpses of this grand spectacle—the eruption of a water-volcano, it may be termed. When quiet is restored, the chalice, and perhaps 20 ft. of the pit, are found empty, and the visitor obtains, so far, a sight of the internal arrangements and structure of the geyser. In a little time, the water reascends to its usual level, and there remains for the next day or two, with only those minor disturbances above described.

GEYSER.

The thermal springs and wells of Iceland may be said to be of three classes.—1. Those of continual and uniform ebullition; 2. Those which, while not constantly ebullient are liable to occasional eruptions; 3. Certain wells not yet particularized, which contain tranquil tepid water, but are supposed (at least in some instances) to have formerly been eruptive. It is only in regard to the second class that there is any room for speculation. To what are we to attribute the occasional eruptions?

The theory started by Sir George Mackenzie, who visited Iceland 1810, is, that steam is gathered in some cavernous recess connected with the subterranean channels through which the water rises; and that, when it has accumulated there till such time as the pressure overcomes the resistance, it bursts forth through the rocky tube, carrying the water before it, and tossing it high into the air. This mechanical theory, as it may be called, has lost ground since the announcement of a chemical one by Prof. Bunsen, who spent 11 days beside the Great Geyser 1846. The learned German looks for an explanation of the phenomena to the molecular changes which take place in water after being long subjected to heat. 'In these circumstances, water loses much of the air contained in it; the cohesion of its molecules is greatly increased, and a higher temperature is required to boil it. When water in this state is brought to the boil, the production of vapor is so instantaneous and so considerable as to cause an explosion. It has been found that the water of the Great Geyser at the bottom of the tube has a temperature higher than that of boiling water, and this goes on increasing till an eruption takes place, immediately before which it has been found as high as 261° F. This peculiarity—for so it is, seeing that, in ordinary circumstances, the hotter water at the bottom would rise to the top till all was equally warm—shows that the heating of the water in the Geyser takes place under extraordinary circumstances. As far as I understand Prof. Bunsen, he implies that the great pressure of the column above, and perhaps some mechanical impediments to free circulation in the form of the Geyser, give these required circumstances. Such being assumedly the case, there is an increase in the cohesion of the molecules of the water constantly going on at the bottom, at the same time that the heat is constantly increasing; at length, the latter force overcomes the former, ebullition takes place, an immense volume of vapor is instantaneously engendered, and an eruption is the consequence.' (From Dr. Robert Chambers's *Tracings of Iceland*. See also Lord Dufferin's *Letters from High Latitudes* (1860); for the American Geysers, the U. S. Geological Survey Reports 1872 and 3; for those of New Zealand, Hochstetter's *New-Seeland*, or Wallace's *Australasia*). We have to consider Bunsen's theory in an unusually curious light in connection with a small double geyser, as it may be called, in the group at Reikholt, and in which each pool makes an eruption every few minutes, the other being at those times pacific.

The water of the Great Geyser contains soda in various forms; but the chief ingredient is a charge of about 31 grammes of silica to 6 gallons. This forms the incrustations around the pools, reaching to the bulk of a little hill around the Great Geyser.

GFRÖRER, *gfrö'rĕr*, AUGUST FRIEDRICH: 1803, Mar. 5—1861; b. Calw, in the Black Forest: German historian. Although he studied for the clerical profession, he had lost all taste for its practical work when he completed his theological education 1825. After studying French and Italian, he became, 1828, a *Repetent*, or tutor, in the theological institution at Tübingen; 1829 was removed to a similar situation in Stuttgart; and 1830 was appointed national librarian. His first work was on Philo and the Judæo-Alexandrian Theosophy in their relation to the doctrine of the New Testament (*Philo und die Jüdisch-Alexandrinische Theosophie*, 2 Bde., Stutt. 1831); first part of a larger work on the History of Primitive Christianity (*Gesch. d. Urchristenthums*), completed 1838 in three other parts. Between the beginning and completion of this work, Gfrörer's views of Christian doctrine had undergone a change. A change of views appeared also in his History of Gustavus Adolphus and his Times (*Gustav Adolf, König von Schweden, und Seine Zeit*, Stutt. 1833–37), for the first edition of that work takes at the commencement the side of the Guelphs, and toward the close, that of the Ghibellines—an impropriety corrected in the 2d ed. (1844–5). After a work on the *Prophetæ Veteres Pseudepigraphi* (Stutt. 1840), Gfrörer published his *Allgemeine Kirchengeschichte* (Stutt. 1841–46), which, extending to seven vols. brings church history down to 1305. While working at this history, he came to the conviction that the Rom. Cath. is the true church, and that the Reformation originated to a large extent in misunderstanding and the ambition of princes. He was called 1846 to the Rom. Cath. Univ. of Freiburg, and there was drawn into manifold conflicts, as also at the Frankfurt parliament 1848; where he was one of the most decided adherents of the party called the *Grossdeutschen*. In 1848 appeared his History of the Carlovingians of e. and w. Franconia (*Gesch. d. ost- u. westfränkischen Karolinger*, 2 Bde., Stutt.); 1855, the first two vols. of a work on the Early History of Mankind (*Urgesch. d. menschlichen Geschlechts*, Schaff.); 1861, the concluding vol. of *Pabst Gregorius VII. und Seiner Zeit*, 7 Bde., Schaffh.). His *Geschichte des* 18 *Jahr* appeared 1863; and *Zur Geschichte deutscher Volksrechte*, 1866. In all these works he gave emphatic expression to his views on ecclesiastical affairs.

GHAMBARU, *gâm-bâ-rô'*: formerly a notable town of Africa, state of Bornu; lat. 13° 5′ n., and long. 12° 5′ e. During the flourishing period of the Bornuese empire, it was the favorite retreat of the kings of the country. It was

taken and destroyed by the Fulahs 1809, and has remained in utter ruin and desolation; so that now almost all traces of the town have become covered with vegetation, and swallowed up by the surrounding forest. The most interesting relic of Ghambaru is a well-preserved portion of an ancient edifice, evidently a mosque. This mosque was of bricks, which, though not so regularly shaped as European bricks, are in other respects said to be quite as good. Ghambaru stands in a district comprising the finest land of Bornu, and which, before the beginning of the present century, was loud with the noise and bustle of hundreds of towns and villages; now, however, it is the haunt of the elephant and the lion, and has sunk back into the condition of the primeval jungle.

GHARA, *gâr'â:* river formed by the junction of the Sutlej and the Beas; most easterly of the rivers of the Punjab. It unites with the Chenab, which has previously collected the remaining three of the five, to form the Punjnud, which thus carries the whole into the Indus. The distance between the two points of confluence is about 300 m. The Ghara is nowhere fordable at any season; and its breadth varies from 200 to 500 yards.

GHARRY. See GAREE.

GHASEL, or GHAZEL: form of lyrical poetry favorite among the Turks and Persians. It is composed of not less than 5, and not more than 17 strophes of two lines each, all the second lines of which rhyme together. The last couplet always contains the real or assumed name of the author. In regard to matter, the Ghasel is either purely erotic and bacchanalian, or allegorical and mystical. Western scholars regard it as the Oriental sonnet. Hafiz is unsurpassed in this kind of verse, and it has also been happily imitated by the German poets, Platen, Rückert, Bodenstedt, etc.

GHASTLY, a. *găst'lĭ* [AS. *gæstlic,* terrible: AS. *gast;* Ger. *geist,* a spirit]: unearthly; spectre-like; death-like; pale; dismal; shocking; dreadful. GHAST'LINESS, n. horror of countenance; a deathlike look: see GHOST.—SYN. of 'ghastly': grim; grisly; horrible; hideous.

GHAT, or GHAUT, n. *gawt* [Hind. *ghât*]: a difficult pass through a mountain; a range or chain of mountains; also. a landing by a water-side, or ferry stairs: see GHÂTS.

GHÂTS, *gawts* (usually written, GHAUTS): buildings along the banks of rivers, for affording easy access to bathers. They are peculiar to n. Hindustan, and line the river banks in most of the great cities, especially on the Ganges. A ghât consists in general of a long, high building fronting the river, to which access is had by several flights of steps which form the essential part of the structure, as the wall or building is only for the protection of loungers from the sun's rays. The uniformity of the long lines of steps is broken by small projections, often crowned by kiosks, which relieve the eye. 'Upon these

ghâts,' says one traveller, 'are passed the busiest and happiest hours of a Hindu's day. Escaping from the narrow, unwholesome streets, it is a luxury for him to sit upon the open steps, and taste the fresh air of the river; so that on the ghâts are concentrated the pastimes of the idler, the duties of the devout, and much of the necessary intercourse of business.' Though the Ganges, the sacred river, is *par excellence* the river of ghâts, one of the most beautiful in Hindustan is that erected at Maheswar, on the Nerbudda, by Alaya Baiee, widow of Holkar; and though Benares prides itself on the greatest number of ghâts, it is almost rivalled by Ujein and other cities.—See Fergusson's *Hand book of Architecture.*

GHAUTS, *gawts* [in English, *Gates* or *Passes*]: two converging ranges of mountains, parallel with the e. and w. coasts of the peninsula of Hindustan, hence known as the *Eastern* and *Western* Ghauts.—1. The Eastern Ghauts extend, with an average height of 1,500 ft., from the vicinity of Balasore, lat. 21° 30′ n., a little n. of the Mahanadi, to within 20 m. of Cape Comorin. Before joining the kindred ridge at this last-mentioned point, they send forth, about 36 m. n. of Madras, a common spur, as it were, of both ranges, which reaches the other range n. of the gap of Palghatcheri. South of the departure of this connecting chain, the Eastern Ghauts become less continuous and distinct. Moreover, they are nowhere a water-shed on any considerable scale, being penetrated and crossed by nearly all the drainage of the interior.—2. The Western Ghauts stretch from the s. side of the Tapti, about the same latitude as Balasore, to their junction with the kindred ridge, 20 m. from Cape Comorin, rather to Cape Comorin itself. Though they are generally far more continuous and distinct than the Ghauts Eastern, yet they are sharply divided by the gap of Palghatcheri, 16 m. broad—the n. section measuring 800 m. in length, the s. 200. Their general elevation appears to vary from about 4,000 ft. to fully 7,000. The peak of Dodabetta in that portion of the Western Ghauts known as the Neilgherries, is said to be 8,760 ft. above sea level. The opposite faces of these mountains differ remarkably from each other. Landward, there is a gradual slope to the table-land of the Deccan; seaward, almost perpendicular precipices generally sink nearly to the level of the sea, at a distance from it ranging from 40 to 70 m., but at one place approaching within 6 miles. From this peculiarity, aggravated, as it is, by the incredibly heavy rains which the s.w. monsoon dashes against the lofty barrier before it, the maritime strip, particularly toward the south, presents that singular feature of the country which is known as the 'Backwaters:' see COCHIN. The Western Ghauts are a water-shed, for not a single stream of any magnitude finds its way through them.

GHAZIPORE, *gâ-zē-pōr′*: city of Hindustan, cap. of the

dist. of Ghazipore in the N. W. Provinces; on the left bank of the Ganges; lat. 25° 32′ n., long. 83° 39′ e. The mean temperature of May, the hottest month, is 97° F.; and of January, the coldest month, 56°. The air is salubrious, owing to the porous character of the soil and the fact that there is a long reach of the river toward the s.e., whence the hot winds generally blow. Large quantities of roses are grown in the vicinity for making rose-water and attar of roses. Pop. about 40,000. The *district* of GHAZIPORE has an area of 2,226 sq. m.: pop. 1,200,000.

GHAZNI. GHAZNEVIDS. See GHIZNI. GHIZNEVIDES.

GHAZZALI, *châ-zâ'lē*, ABU HAMID MOHAMMAD IBN AHMAD, surnamed ZAINEDDIN (glory of the law): eminent Mohammedan philosopher, and zealous adherent of Sufism: 1058 (450 H.)—1111 (505 H.); b. at Tus, in Khorassan, birthplace also of Firdusi, and burial place of Harun-al-Rashid. The surname Ghazzali was given to him, according to some, because his father dealt in *ghazal* or spun cotton. Left an orphan at an early age, by the advice of his guardian, a Sufi, he went to Djorshan, for study and science, which he intended to make a means of support; and became the favorite pupil of Abu Nasr Ismail, eminent teacher. Afterward at Nishapur, he attended the lectures of the learned Imam of the two sanctuaries (Mecca and Medina) on law, polemics, philosophy, and theology, and remained till the death of his instructor. The grand vizier of Bagdad then appointed him (1091) to a professorship at his *Nizamjé* (university), which he left four years later, in order to perform the holy pilgrimage to Mecca. On his return he visited Jerusalem and Damascus, and remained ten years at the mosque of the latter place, leading a studious and ascetic life. He afterward visited Cairo, Alexandria, and other places in Africa, everywhere teaching and lecturing on religion and science, and returned for a short time to Nishapur; but finally went back to Tus, his native place, where he died, having founded a monastery for Sufis, and a college for the studious.

Of the 99 works written by him (mostly in Arabic, a few in Persian), the most famous is his *Ihjá Olum ad-Dín* (Restoration of Religious Sciences), a work so remarkable and exhaustive, that it has been said: 'If all the books of the Islam were lost, and we had only this one left, we should not miss the others' (*Haji Khalifah*). The academies of the West, however, Cordova, Morocco, Fez, etc., condemned it as contrary to the teachings of the Sunna (q.v.), and had it publicly burned. Next in importance is his great philosophical work *Taháfat Al-Filásafah* (Overturning of the Philosophers), which has survived only in Hebrew translations, and gave rise to a warmly contested controversy between him and Averroës (Ibn Roshd). Notable also was his commentary on the 99 names of God, and an ethical treatise, *O Child!* published

and translated into German by Hammer-Purgstall. About one-third only of his works is known to have survived, and of this but a very small part has been published.

GHEBERS, or GHEBRES, or GEUBERS, n. plu. *gā'bėrz* [Pers. *ghebr;* Ar. *kafir;* Turk. *giaour*, an infidel]: the anc. Persian fire-worshippers, so called by the Mohammedans; a Parsee; also written GHAVERS: see GUEBERS.

GHEE, n. *gē* [Hind. *ghi*]: clarified butter used in many parts of India; prepared generally from the milk of buffaloes. The fresh milk is boiled for an hour or more; it is then allowed to cool, and a little curdled milk, called dhye, is added to promote coagulation. The curdled mass is churned for half an hour; some hot water is then added; and the churning continued for another half hour, when the butter forms. When the butter begins to become rancid, which is usually the case after a few days, it is boiled till all the water contained in it is expelled, and a little dhye and salt, or betel-leaf, is added; after which it is put into closed pots to be kept for use. It is used to an enormous extent by the natives of many parts of India, but is seldom relished by Europeans.

GHEEL, *gāl:* well-known colony for the insane; a town of Belgium, province of Antwerp, 26 m. e.s.e. of the town of Antwerp. It is literally an oasis in a desert; a comparatively fertile spot, inhabited and cultivated by 10,000 or 11,000 peasants, in the midst of an extensive sandy waste, called the Campine, where neither climate, soil, nor surroundings invite a settlement. There are no gentlemen's seats in the district, and the farm-houses, though neat, and generally surrounded by trees and a garden, are evidently in the hands of the poor. Their frequency shows this. They are sometimes built of brick; much more generally, they are of wattled or wicker-work, thickly laid over with mud or plaster, and whitewashed: usually they are of comfortable size. The people inhabiting these seem to be about the rank of English cottagers, but are inferior in aspect, tone of character, and cleanliness of habits. The dwellings are arranged into three classes, or cordons: those of the village proper; those scattered around in its immediate vicinity; and those collected into hamlets in the more distant and least reclaimed portions of the commune, which may be about 20 m. in circumference.

Historically, Gheel is noted as the spot where a woman of rank, a Christian convert, said to have been of British origin, was murdered by her pagan father, who in his brutal revenge gave the church a martyr. Pilgrims, the sick, the sorrowful and the insane, visited the tomb of the Christian virgin; the last, it is said, were restored to sanity and serenity. Dymphna became the tutelar saint of those stricken in spirit; a shrine rose in her honor, which now, for ten centuries, has been consecrated to the relief of mental disease, is said to have been dis-

tinguished by constant success, and, at all events, has collected around it hundreds of lunatics, chiefly of the poorer classes, under every form and stage of nervous malady. Formerly, besides the benefit from proximity to the ashes of the saint, and from the prayers of the church, the afflicted underwent a sort of novitiate in a building adjoining the church, where they were chained to the wall, and subsequently passed under the mausoleum of their patron, etc.; but now, though faith lingers, there do not appear to be any other than the ordinary ministrations of the church to which the patients belong, resorted to as treatment.

About 1,300 insane persons are lodged with the citizens of this community, or with 1,000 heads of families, and are controlled and employed by them, and this without recourse to walls or other asylum appliances, and with little coercion of any kind. The quiet and industrious reside generally one in each family in the town, the more excited in the suburban cottages, and the most unmanageable with the laborers on the confines of the commune. The effect produced by this large body of lunatics wandering, working, displaying many of their peculiarities in the midst of a thriving sane population, whose support depends chiefly on a traffic in insanity, is both striking and picturesque. In the enjoyment of comparative liberty, and of what is called the free-air treatment, these patients are, on the whole, contented, tranquil, and healthy. Violence is rare; only two suicides have occurred in four years; and morality is less outraged than in more protected classes. Each individual is maintained for about 13 to 15 cts. *per diem.* Until recently, this colony was merely a psychological curiosity; recently, the anomaly and absurdity of treating all cases alike, and independently of medical aid, have led to the institution of a medical staff, the erection of a hospital, and the introduction of many salutary alterations in the relations between the insane and their custodians, in classification and supervision. The compatibility of the seclusion of the insane with greater freedom, with domestic life, and association with the sane, has suggested the introduction of cottage asylums, as a modification in the accommodation of this class in other countries. See *Gheel,* by Jules Duval (1860); *Die Irrencolonien,* by Brandes (1865); *Gheel,* by Ruëdy (Bern, 1874).

GHENT, *gĕnt* (Flem. *Gend,* Ger. *Gent,* Fr. *Gand*): important city of Belgium, cap. of the province of E. Flanders, at the confluence of the Lys and the Scheldt, 31 m. w.n.w. of Brussels. It is divided by canals into 26 islands, connected by 270 bridges, and is encompassed with gardens, meadows, and pleasant promenades. It is surrounded by walls, pierced by seven gates, and inclosing an area eight m. in circuit, and is in general well built; but in the older part its quaint and fantastic houses render it in the highest degree picturesque. Among the chief buildings are the Church of St. Bavon, containing the famous *Adoration of*

the Lamb by the brothers Van Eyck; the new citadel, finished 1830; the Palace of Justice, built 1844, and having a peristyle of the Corinthian order; the university, connected with a school for civil engineering, and for trades and professions; the Beguinage, a convent containing about 700 nuns; the Royal Gymnasium; and the Acad. of Painting. Cotton and woolen manufactures are on a great scale. There are many cotton-mills, and about 25,000 workmen are employed in spinning, printing, dyeing, and weaving of cotton, woolen, and linen fabrics. Leather, paper, and carpets also are manufactured, and there are foundries, machine-works, and sugar-refineries. Specially noteworthy is the floriculture of Ghent, an important and flourishing branch of industry. By the Great Canal, which flows into the Scheldt, Ghent has communication with the sea, and it can receive into its docks vessels drawing 18 ft. of water. The new dock or basin on the n.e. side of the city is capable of holding 400 vessels. Pop. about 170,000.

Ghent is mentioned in history as early as the 7th c. About 868, Baldwin Bras-de-Fer, first Count of Flanders, built a fortress here against the Normans. Under the Counts of Flanders, Ghent continued to prosper until, in the 14th c., it was able to send 50,000 men into the field. The wealth of the citizens of Ghent, and the usual measure of liberty which they enjoyed, encouraged them to resist with arms any attempt to infringe upon their peculiar rights and privileges. This readiness to arm in their own defense is exemplified in the famous insurrection of Jacob van Artevelde (q.v.), and other instances. For many years, Ghent maintained a vigorous, but unavailing resistance against the Dukes of Burgundy—who wished to be recognized as Counts of Flanders—and the kings of Spain. In the various wars of which the Netherlands has been the battle-ground, Ghent suffered severely, and was frequently taken. In 1792, the Netherlands fell under the power of France and Ghent was made cap. of the dept. of the Scheldt, continuing under French dominion until the fall of Napoleon, 1814, when it was incorporated with Flanders in the kingdom of the Netherlands.

GHENT, Treaty of, *gĕnt:* negotiated for the settlement of the second war between the United States and Great Britain, at Ghent, Belgium, concluded 1814, Dec. 24, ratified 1815, Feb. 17. Though no decision was reached by it on three points of great interest to the United States —impressment of American seamen, American fisheries rights under the treaty of 1783, and character and extent of naval force to be maintained by each party on the great lakes—it was beneficial in officially ending the war, providing for the settlement of numerous boundary disputes between the two countries, and binding both countries to use their best efforts to break up the African slave trade. All territory, places, and possessions captured by one party from the other were to be restored, except certain islands

in and near Passamaquoddy Bay, the possession of which was to be determined by a special commission, or in case of failure to agree, by the arbitration of a friendly power. Provisions were made for commissions to establish the boundary line from St. Croix river to the junction of the 45th parallel and the St. Lawrence river, to determine the centre of the water-communications from that point to Lake Superior, and to adjust the limits from the water-communications between Lakes Huron and Superior to the most n.w. point of the Lake of the Woods. In these cases also arbitration was provided in the event of the commissions disagreeing.

GHERARDESCA, *gā-râr-dĕs'kâ:* family of Tuscan origin, conspicuous in the history of the Italian republics during the middle ages. Their vast territorial possessions lay between Pisa and Piombino. In the 13th c., the Counts Gherardesca had preponderating authority in the republic of Pisa, and were prominent supporters of the popular interests, in opposition to the encroachments of the nobles. In the great feud between the Guelphs and Ghibellines, they became warm partisans of the latter, and were the irreconcilable enemies of the Visconti, who headed the Guelphs. The most famous of this family, both for the historical events of his career, and for the appalling tragedy of his fate, is Count Ugolino, whose name and fate have been invested with undying interest by Dante. Count Ugolino, more than any of his race, was possessed by a lawless ambition, and a subtle, unscrupulous spirit. Having resolved to usurp supreme power over Pisa, he formed an alliance with Giovanni Visconti, head of the Guelphic party, who promised to supply him secretly with soldiers from Sardinia. The plot was, however, discovered, and both Giovanni and Ugolino were banished from the city. The former died soon after; but Ugolino, uniting himself with the Florentines and the Lucchese, forced the Pisans, 1276, to restore him his territories, of which he had been deprived. No sooner was he reinstated in his possessions than he began to devise anew ambitious schemes. The war of the Pisans with the Genoese afforded him an opportunity. In the battle fought at the island of Malora, 1284, Aug. 6, Ugolino, by treacherously abandoning the Pisans, occasioned the complete annihilation of their fleet, with a loss of 11,000 prisoners. When the news of this disaster spread, the Florentines, the Lucchese, the Sienese, the Pistoians, and all the other enemies of the Pisan republic, gathered together to destroy it, as the stronghold of the Ghibellines in Italy. Being thus brought to the brink of ruin, the Pisans had no resource but to throw themselves into the arms of him whose treachery had reduced them to such misery. From the time of his election, he gave free scope to his vindictive, despotic nature, persecuting and banishing all who were privately obnoxious to him, on pretexts of state delinquency, till at length a conspiracy was formed against

him, headed by his former supporter, the Abp. of Pisa. Dragged from his palace, 1288, July 1, he was thrown into the tower of Gualandi, where he died of starvation.

GHERARDI, Bancroft: an American naval officer; b. 1832, Nov. 10; d. 1903, Dec. 10; entered the navy, 1846. At the beginning of the civil war he was a lieutenant on the *Lancaster,* of the Pacific squadron; was promoted lieut.-commander, 1862, afterward commanded first the *Chocours* and then the *Port Royal.* With the latter he participated in the battle of Mobile Bay, and signally distinguished himself. He was promoted rear-admiral, 1887; directed the Columbian naval review in New York harbor, 1893; retired, 1894.

GHETTO, *gĕt'tō*: name for the quarter of a city where Jews were compelled to reside by themselves. The word is doubtless of Italian origin, and generally derived from the fact that the Jewish quarter in Venice, which existed in 1816, lay near a cannon foundry, which is termed in Italian, 'gheta.' It has been otherwise explained as an abbreviation of the Italian 'borghetto,' a small burg or quarter; as derived from the word 'get,' Hebrew for a bill of divorce; from 'Gitter,' German for bars. Before the institution of the Ghetto in Venice, such separate quarters were called 'Judiaria' in Portugal, 'Juiveve' in France, 'Carriera' in Provence, 'Judaicam' in Capua (1375), which word, it is claimed, became 'Giudeica' in Italian, to be corrupted finally into 'Ghetto.' Despite other terms like 'Vicus Judacorum,' 'Judenviertel,' 'Judengasse,' etc., the word 'Ghetto' has survived as the typical appellation.

While in those early ages, with their unsettled conditions in church and state, the Jews naturally preferred to live together, either for protection or close fellowship, such residence was not compulsory. The proscriptive and exclusive Ghetto, however, was a measure in line with the Jew badge (q. v.), to degrade the Jew, expose him to odium, and develop a narrowness and clannishness unknown to the principles of Judaism at its best. While the practice was earlier in vogue here and there, from the fifteenth century the Ghetto became the Jews' legal place of residence, his habitat, so to speak, out of which he could not for centuries emerge. Before that date, Portugal had banished the Jew to special quarters, closed every evening when the bells sounded for prayer, and guarded by two royal watchmen. In 1516, Venice established its compulsory Ghetto in the island of Lunga Spina. In 1556, Pope Paul IV. Caraffa formed the Ghetto of Rome, other Italian cities quickly following. In 1312, Palermo had its Ghetto, the custom soon spreading through Sicily. In Germany, Cologne had its Jews' Gate in 1206. In 1341, the Jews had to pay twenty marks yearly to Cologne's town officer for his services in locking and opening the gate at sunset and sunrise respectively. Similar quarters existed at Ratisbon, Nuremburg, Worms (as early as 1231),

Speyer (as long ago as 1084), Treves in 1362; while in 1460 the Jews in Frankfort-on-the-Main had to live in one special street. The same institution, and doubtless for similar motives, arose throughout Europe and the East—in Morocco, to-day, for example, the Mellah is the Jews' Ghetto of the Middle Ages, his exclusive quarter.

While the Ghetto often became the scene of sorrow and desolation, when it was stormed by a ruthless mob at an era of persecution, or when it fell a prey to fire and flood—as the annals of Rome and Prague in particular show—it developed a life of its own often of singular beauty and potency, as described in the works of L. Kompert, A. Bernstein, S. Kohn, S. H. Mosenthal K. E. Franzos, and illumined by the art of Moritz Oppenheim, the painter of old Jewish family life. The synagogue became the centre of its world, the home, the altar and school; and amid all strain and narrowness the people preserved their buoyancy and hope. Some of the most famous rabbis and scholars were born in the Ghetto, and in its cramped, gabled dwellings, books in varied lines of knowledge were written, and sages taught the law and the traditions undismayed. The social atmosphere and the domestic virtues were pure and inspiring at epochs when at court and in the ordinary world coarseness and ribaldry flourished without restraint. Thus the Ghetto became a preservative, and if it necessarily narrowed the range, it deepened the faith and intensified the feeling. Rome, Venice, Frankfort and Prague had the most typical mediaeval Ghetto, associated with some of the most thrilling experiences in Jewish history. In Rome, probably the oldest Jewish settlement in Europe, for centuries the Ghetto was the centre of the most humiliating and degrading scenes, but with the nineteenth century, the rigor of Ghetto legislation was somewhat relaxed, until in 1870 when Victor Emanuel abolished the Ghetto, whose walls were torn down in 1885, one of the most beautiful synagogues in the world being erected in the section. While Goethe drew instruction from the Ghetto of Frankfort and owed to his teacher from that quarter, his knowledge of Hebrew, it affected Heine less favorably in 1815. Generally, however, the French Revolution, so ominous for all forms of oppression, razed the Ghetto walls; and if an era of reaction subsequently arose, the days of 1848 effectually swept away all traces of Ghetto legislation, except, of course, in lands like Rumania and Russia which still await an era of enlightenment.

It cannot be denied that the Ghetto retarded the inner development of Judaism, and gave rise to conditions and customs that are hard to overcome even in more favorable times. A few decades of civil and religious liberty, however, produce a different atmosphere fatal to aberrations that spring from gloom and repression. A complete history of the Ghetto is still to be written. See D. Philipson, *Old European Jewries* (Philadelphia, 1894); Abrahams, *Jewish Life in the Middle Ages* (1896).

GHIBELLINE, n. *gĭb′ĕl-lēn* [supposed to have been so named from *Weiblingen*, one of their castles]: a political faction in Italy in the 12th century. On the death of Lothaire II., emperor of Germany, 1137, Dec. 4, Conrad, Duke of Franconia and Lord of Weiblingen (which by corruption became Ghibelline), was elected his successor. His right to the imperial throne was, however, disputed by Henry the Proud, Duke of Saxony and Bavaria, who was in consequence declared an outlaw and shortly afterward died. His adherents transferred their allegiance to his son, Henry the Lion, at that time a boy of 10, and the whole empire was divided into the partisans, of Conrad, who assumed the name of Ghibellines, and those of Henry, or the Guelphs (q.v.). These titles were first used at the battle of Weinsburg in 1140. The strife between the two parties subsided in Germany, but continued in Italy, resulting in war in 1159. The supporters of the popes were termed Guelphs and those of the emperors Ghibellines. Charles of Anjou expelled the Ghibellines from Italy in 1268; but the contest between the two factions continued till the French invasion in 1495 united them against a common enemy.

GHIBERTI, *gē-bĕr′tē*, Lorenzo: abt. 1378–1455; b. Florence: famous Italian sculptor. He was educated in art by his stepfather, a skilful goldsmith, and rapidly acquired dexterity in drawing, painting, and modelling. At the age of 19, he was selected for the execution of a noble fresco in the palace of Prince Pandolfo Malatesta at Rimini. With seven other artists, he was next chosen by the Florentine guild of merchants to compete for the execution of a splendid gate in bronze, to suit that executed by Andrea Pisano in the baptistery of Florence, about 1340. The subject of the design was *The Sacrifice of Isaac*, to be executed in bas-relief as a model for one of the panels. The judges found difficulty in deciding between Brunelleschi, Donatelli, and Ghiberti, but the two former generously proclaimed the superiority of Ghiberti's design, both with respect to the art and beauty of its conception, and the delicacy and skill of its execution. When Ghiberti had completed his great work, his fellow-citizens intrusted him with the execution of another gate, to emulate the beauty and colossal dimensions of the two already adorning the baptistery. From Michael Angelo, Ghiberti received a noble tribute of admiration, when the great artist asserted that *the two gates were worthy of Paradise*. Ghiberti's second gate contains ten reliefs on a larger scale, the subjects in this case also being wholly biblical. The mingled grace and grandeur of these compositions are in the highest degree admirable. Not the least of Ghiberti's merits was his breaking away from the conventionalism that before his day hampered the free development of sculptural art. Among his works are a bronze relief in the Duomo at Florence, representing San Zenobi bringing a dead child to life, and bronze statues of St. John the Baptist, St. Matthew, and St. Stephen. Ghiberti died at Florence.

GHILAN, *ghē-lân;* a border province of Persia; s.w. portion of the narrow strip of country between the Elburz range and the Caspian Sea; between lat. 36° 30′ and 38° 30′ n., and long. 48° 33′ and 50° 30′ w. It is more than 150 m. in length, and about 70 m. greatest width. From the lowness of the land it is subject to frequent inundations, and during great part of the year is little better than a swamp. The climate is unhealthful. There are dense forests, and mulberry trees are grown for production of silk. The soil is fertile, bearing barley, hemp, hops, fruits, and great quantities of rice. Pop. estimated 100,000.

GHIRLANDAJO, *gēr-lân-dâ′yō* (or Corradi, *kor-râ′dē*), Domenico: 1451–95; b. Florence: eminent painter of the early Florentine school. From his youth, he was educated to the craft of the goldsmith by his father, who received the name Ghirlandajo as inventor of some silver ornaments of elegance, in the form of a wreath or *ghirlanda*, which became the favorite head-dress of the Florentine beauties of his day. At the age of 24, Ghirlandajo abandoned working in gold, and studied painting, in which he became not only a famous and lauded artist, but also one of the most progressive and original masters of his age. His greatest works are frescoes, but he left also fine easel paintings, both in oil and distemper, and his compositions in mosaic—or 'eternal painting,' as he termed it—are unrivalled for brilliant coloring and for the delicate softness with which the colors are blended and graduated. The Capella di Sassetti, in Florence, contains a noble series of Ghirlandajo's frescoes, illustrative of historical and legendary incidents in the life of St. Francis. They are strongly characterized by the wonderful mastery of intense and varied human expression, which, more than accurate delineation of form, was the great merit of Ghirlandajo's paintings. The Church of Santa Maria Novella also is rich in this artist's work, being adorned by a set of frescoes representing scenes from the life of John the Baptist, many of the figures being correct likenesses of some celebrities of the day. Ghirlandajo was the first artist who adopted correct principles of perspective, just gradations of shade and form, and dramatic art in grouping. His son, Ridolpho Ghirlandajo (1483–1560), was a painter, whose earlier works were well received, but who lacked earnestness and patience.

GHIZEH, or Gizeh, *ghē′zėh*, (Coptic, *Tpersioi*): village in Egypt, near the n. border of Middle Egypt, on the opposite side of the river, about three m. w.s.w. from Cairo. In the immediate vicinity the great pryamids commence (see Pyramid). Here is still seen the process of egg-hatching in ovens, a practice continued from the time of the Pharaohs. Ghizeh, formerly adorned with beautiful palaces and mosques, is now a mere village, and there is little indication that buildings of some pretension once existed here.

GHIZNEVIDES, *gĭz'nē-vĭds:* celebrated dynasty, whose empire, in the height of its power, extended from the Tigris to the Ganges, and from the Sihon or Sir-Daria to the Indian Ocean. The founder of the dynasty was Alepteghin, originally a slave belonging to Abdulmelek, the Samanî Ameer of Bokhara. He was appointed gov. of Khorassan; but on the death of his benefactor he rebelled, and proceeded at the head of an army to Ghizni, of which he took possession 961, and for 15 years successfully withstood the whole power of the Samanî (q.v.). On his death, Sebekteghin or Sabactagî was unanimously chosen his successor. He was distinguished for prudence and valor, and equally for humanity and justice. By him the kingdom was extended from the Indûs to Khorassan, and from the Gulf of Oman to the Amû-Daria or Jihon; and in the latter province his son, Mahmûd, was appointed gov. under the nominal suzerainty of the Samanî. Sebekteghin died 997, and was succeeded by his younger son Ismâil; but Mahmûd the elder, hearing of his father's death, hastened to Ghizni, and assumed the reins of government 998, with the title of Sultan. In the year following, he took complete possession of Khorassan, and 1001 began a series of destructive inroads into Hindûstân. Falling in with Jeypâl prince of N.W. India, at Peshawur, Sultan Mahmûd, on the 8th of Mohurrim (Nov. 26), defeated him with immense slaughter. In 1004, while on his second expedition to India, he was recalled by the news that Eylek Khân of Khashgar, who in 999 had conquered the Samanî and taken possession of their territory, was ravaging Khorassan and Balkh; on hearing which Sultan Mahmûd, leaving his conquests, returned in an incredibly short time to Ghizni, and thence proceeding without delay to Balkh, engaged in battle with the enemy, and completely defeated them. He then took possession of the country between the Sihon and the Jihon (ancient Transoxiana). In 1007 and 1009, Sultan Mahmûd made his third and fourth expeditions into Hindûstân, and each time carried off immense booty in money, jewels, and slaves. On his return to Ghizni, he made a liberal distribution from his treasures among the poor and the ministers of religion. About this time he reduced Ghûr, Gherjistân, and Khaurezm, bestowing the latter province upon Altun-Taush, one of his favorite generals. In 1024, he was engaged in his last expedition against the Hindûs, the famous expedition to Somnaut (q.v.), at the s. extremity of Guzerat: here he obtained an enormous booty. In 1027, he received from the Caliph Ul Kader a ratification of all his conquests, together with numerous titles of honor, and in the two following years having conquered Irak, Tebriztân, and Mazanderan, he returned to his capital, where he died, 1030, Apr. 29. At this time the empire of Ghizni was at the summit of its glory, having in 69 years extended over 38 degrees of longitude and 20 of latitude. Mahmûd possessed some exalted qualities of character, but they were much obscured by his sanguinary zeal for the advancement of Islam. He was succeeded by his younger son Mahomed, who in Oct.

of the same year was compelled to resign the sovereignty to his elder brother, Mussaûd I. This prince was signally defeated in 1037 by the Seljûks (q.v.), who had taken possession of Khorassan under Toghrul Beg and Tchegher Beg, grandsons of Seljûk. Though an able and warklike prince, misfortunes crowded thickly round his declining years, and in 1041 he was put to death. During his reign the Seljûks took possession of Bâlkh, Khorassan, Khaurezm, Herât, and Irak. The sovereigns who in succession reigned in Ghizni were Mûdud (reigned 1041–49), Mussaûd II. (1049), Ali (1049–52), Abdurrashîd (1052–3), and Furrukhzaud (1053–58), of whose reigns there is nothing worthy of relation, beyond the intestine quarrels at Ghizni, and the encroachments of the Seljûks on the west and north. The reign of Furrukhzaud, however, shed lustre over the expiring glory of Ghizni, for the Seljûk prince, Daoud, thinking to take advantage of the dissensions at Ghizni, marched toward it; but he was met by Nûshtekein, one of the best generals of the age, and signally defeated. Taking advantage of this victory, Nûshtekein marched into Khorassan to recover that province, and encountering Kellisaurek, a celebrated Tûrkman chief, totally defeated him. On news of this second defeat, Alp-Arslan (q.v.) was sent by his uncle Toghrul Beg to stop the progress of the G.; and in the battle which ensued, fortune changed sides, and Nûshtekein was totally defeated: a treaty of peace was then concluded. Furrukhzaud was succeeded by Ibrahim (reigned 1058–98), Mussaûd III. (1098–1114), Arslan Shah (1114–18), and Behram Shah (1118–52). During the reign of this last prince the Ghûri, a tribe inhabiting the mountainous country of Ghûr; began to make inroads upon the territory of Ghizni, and growing bolder by success, attacked and took the capital itself, driving Behram Shah across the Indus. But on the retreat of part of the Ghûri to their own country, Behram Shah returned and retook his capital, making prisoner the Prince of Ghûr, Seyfud-deen Souri, whom he put to death with the most refined cruelty. On learning this, the brother of the unfortunate prince, Allah-ud-deen, hastened from Ghûr, and having defeated Behram Shah, gave up Ghizni to be pillaged by his followers. Behram Shah, thus driven a second time across the Indus, desisted from all further attempts to regain his ancestral dominions, and died 1152. His son Khosrû Shah succeeded him, and took up his residence in Lahore; but the many attempts which he made to repossess himself of Ghizni and the surrounding territory were unsuccessful. Khosrû Melek, 17th and last monarch of the dynasty of Ghizni, occupied himself (1160–66) in the first part of his reign (1160–86), in extending and consolidating his Indian possessions, but subsequently his whole energies were required to repel the attacks of Shahab-ud-deen Mahommed, Prince of Ghûr, who, having conquered all the territory w of the Indus, now sought to drive the race of Sebekteghin from their last possession. In 1184, Lahore was all that remained to Khosrû Melek, and the taking of that city by the Ghûrian prince 1186 put an end to the power of the Ghiznevides.

GHIZNI, *ghėz'nē:* river of Afghanistan, loses itself, after a southerly course of about 80 m., in the salt lake of Abistada, 7,076 ft. above the sea. The Ghizni's source is 12 m. n. of the city of Ghizni (q.v.), and its mouth is about lat. 32° 35′ n. and long. 68° e. Its embankments, dating from the 11th c., are still fit for the purposes of irrigation.

GHIZ'NI: city of Afghanistan; anc. cap. of the empire of the Ghiznevides (q.v.). It stands at an elevation of 7,726 ft., on a scarped rock, 280 ft. above the adjacent plain. Its natural strength has been increased by walls 35 ft. in height, and a wet ditch. In 1839, July, Ghizni was stormed by the British under Lord Keane; and 1842 it was first surrendered to the Afghans, and then retaken by Gen. Nott. Eventually it was restored, with the rest of the country, to Dost Mohammed. It is in long. 68° 18′ e., and lat. 33° 34′ n.—The remarkable altitude of the spot brings, in winter, a temperature of about 20° Fah. below zero. Ghizni is an entrepôt of the trade between Afghanistan and the Punjab. Pop., fluctuating perhaps with the season of the year, variously estimated below 10,000.

GHOGRA, or Ghagra, *gâ'grâ:* one of the largest affluents of the Ganges, joining that river from the left, lat. 25° 46′ n., and long. 84° 40′ e., after a generally s.e. course of 600 m. It rises in lat. 30° 28′ n., and long. 80° 40′ e., on the s. declivity of a mountain-range, which separates the dist. of Kumaon from s.w. Thibet. The actual source, being between 17,000 and 18,000 ft. above the sea, is hidden under perpetual snows, while in winter it can scarcely be said to flow at all. Through the first 50 m. the torrent, tumbling down deep gorges, is in many places entirely concealed by glaciers. After receiving many tributaries on both sides, it enters the great plain of Hindustan in lat. 29° 6′n., and long. 80° 13′ e., where, after a flow of 148 m., it is 798 ft. above the sea. Here it has been estimated to be about two-thirds of the size of the Ganges at the corresponding point of Hurdwar. To this point it has generally formed the boundary between Kumaon and Nepal. Before the Ghogra has descended 70 m. further, it has become navigable for craft of considerable burden. Further down, it is practicable for boats of all sizes at every season, though here and there beset by dangerous and intricate shoals. Like other great rivers traversing alluvial tracts (see Ganges), it sends off lateral water-courses, which in the rainy-season communicate with the parent-flood and with each other. The principal auxiliaries, in their order, are the Kalipani on the left; Dhouli, on the right; Gorigunga, on the right; Chumalea, on the left; Western Surju, on the right; Lohogatalu, on the right; Ladhia, last of its hill tributaries, on the right; Kurnalli, on the left; united Chonka and Woel, on the right; Eastern Surju, on the left; finally, the Rapti, on the left.

GHOR: see El Ghor.

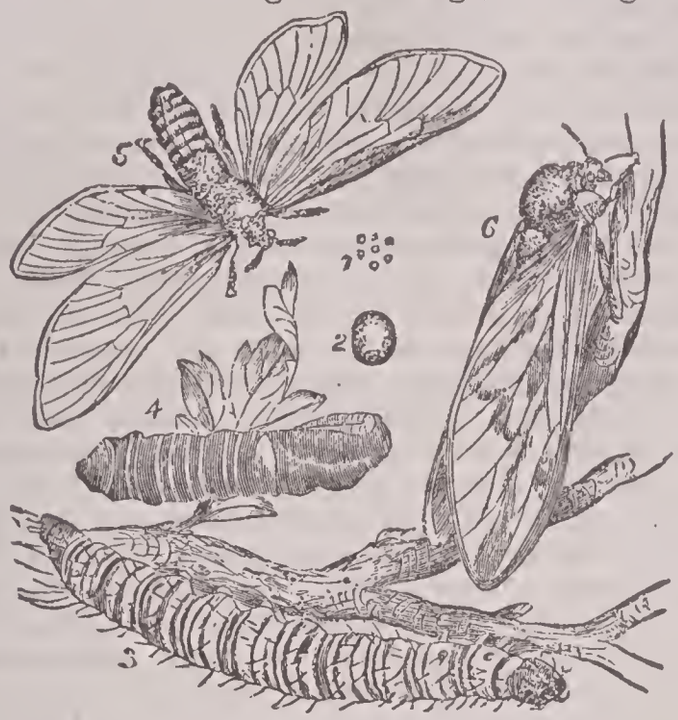
GHOST, n. *gōst* [AS. *gast;* Ger. *geist,* a spirit: comp.

Gael. *geas*, a charm, sorcery]: an apparition or spectre; the soul or spirit of a deceased person (see APPARITIONS: HYPNOTISM): V. in *OE.*, to haunt with ghosts or apparitions. GHOST'ING, imp. GHOSTED, pp. *gōst'ĕd*. GHOST'LY, a. *-lĭ*, pertaining to the soul or spirit; spiritual; not carnal; not secular; relating to apparitions. GHOST'LINESS, n. GHOSTLIKE, a. ghostly, having sunken eyes. GHOST'LESS, a. without spirit or life. HOLY GHOST, the Third personal Distinction (commonly termed 'Person') in the Divine Trinity; the Comforter; the Advocate; the Paraclete (see HOLY SPIRIT, THE: TRINITY, DOCTRINE OF THE: PROCESSION OF THE HOLY SPIRIT: FILIOQUE). TO GIVE UP THE GHOST, to die; to yield up the breath or spirit. *Note.*—In *English* the words GHASTLY and GHOSTLY are closely united in sense, though somewhat confused in their derivations.—Syn. of 'ghost': phantom; vision; phantasm; spirit; soul.

GHOST DANCE, a religious ceremony which originated among the Piute Indians in Nevada about 1889, so named from the fact that the dancers wear a white robe over their ordinary dress. It was the outcome of a religious belief which maintained that a messiah was soon to appear, who would rid the land of the white man and restore to the Indians all their rights. A Piute Indian named Wikova and known among the whites as 'Jack Wilson,' claimed to be this savior and obtained a marvelous influence over not only his own tribes but those of the surrounding country, who sent their chiefs to listen to his teachings. These were very much in the same line as those of modern Spiritualists, he promising to procure them communication with the spirits of deceased friends. He advocated peace and refused to allow any references in their ceremonies to warlike subjects. The ghost dance is held at night, men and women joining hands and circling around, singing the ghost songs, which are principally chants in the form of messages from their spirit friends. Sometimes the participants appear to fall into a trance, during which they are supposed to commune with residents of the other world. The Sioux outbreak of 1890–1 was due indirectly to the ceremonies of this dance and the United States government sought to suppress it. Since that time no trouble has arisen.

GHOST-MOTH (*Hepialus hamuli*): species of moth of which the caterpillar—in some countries, called the OTTER—often commits great ravages in hop plantations, devouring the roots of the hop. It feeds on the roots also of the nettle, burdock, and some other plants. This moth belongs to a family (*Hepialidæ*) often popularly called *Swifts*, from their rapid flight, having long narrow wings, and destitute of a tongue. The antennæ are short. The male Ghost-Moth is entirely of satiny white color above; the female yellowish with darker markings; both sexes are brown on the under side. In England they are seen flying about in the twilight, generally over lawns and pastures, frequently in

churchyards, from which fact—and from the white color of the males and their sudden disappearance in the imperfect light on their folding their wings, or rising above the



Ghost-Moth (*Hepialus humuli*):
1, eggs, natural size; 2, the same, magnified; 3, larva or caterpillar; 4, chrysalis; 5, imago or perfect insect, male; 6, the same, female.

level of the spectator's eye so that the brown part is turned toward him—they derive their name. The caterpillar, sometimes two inches long, is yellowish white, with scattered hairs. It spins a large cylindrical cocoon among the roots on which it has been feeding, and there becomes a chrysalis.

GHOUL, n. *gôl* [Pers. *ghul*, a mountain demon]: a supposed demon that feeds on the dead; also spelled GHOLE.

GHUMURDJINA, *gŭm-ôr-jē'nâ*, or KOMULDSI'NA: town of European Turkey, in the vilayet of Rumili, on the right bank of the Karadji, about 80 m. s.w. of Adrianople. It has extensive bazaars and a small citadel. Pop. supposed about 8,000.

GHÛR, *gôr*, or GHORE, *gōr:* mountainous district of western Afghanistan, s.e. from Herât. It was conquered by the famous Sûnní hero, Mahmûd of Ghizni (q.v.), and about three centuries afterward was overrun by Genghis Khan, who almost completely exterminated the ancient race of inhabitants. It was the original possession of the princes who established the second Mohammedan dynasty. in Hindûstân. It is inhabited now by the independent nomad Tartar tribes of the Hazâreh and Eimâk, principally the latter.

GHÛRI, *gô-rĭ*, or SULTANS OF GHÛR: race of princes who had the seat of their empire in the country of Ghûr (q.v.), and ruled over Persia, n. Hindûstân, and Transoxiana. The first of this family mentioned in history is Sûri, who opposed an obstinate but unavailing resistance

to Sultan Mahmûd of Ghizni. One of his descendants, named Husseyne, was subsequently appointed gov. of Ghûr, in which office he was succeeded by his sons. But Behram Shah having put to death one of the brothers, the others threw off their allegiance to the race of Sebekteghin, and hostilities ensued (see GHIZNEVIDES), in which the eldest brother, Seyf-ud-deen, was killed, and his brother, Allah-ud-deen, surnamed Jehaun-souz (the Conflagrator). succeeded to the sovereignty. After subduing the sultan of Ghizni, Allah-ud-deen invaded Khorassan, but was defeated and taken prisoner by Sultan Sunjur the Seljûk. He was succeeded by his son Mahommed 1160, who was assassinated at the end of the first year of his reign. Gheiatheddin Mahommed ascended the throne 1161, and after a long and bloody contest with the Khaurezmians, obtained possession of Khorassan. During his reign the affairs of Ghinzi were committed in charge to his brother, Shahab-ud-deen Mahommed, who, having subdued the Ghiznevide provinces w. of the Indus, crossed that river and conquered successively the provinces of Mûltan (1176), Lahore (1186), and Ajmere (1190), defeating the rajah of Ajmere's army numbering 300,000 horse and 3,000 elephants, and in the course of the next six years conquering Hindûstân as far s. as Nagpûr, and w. to the Irrawady. From this epoch the preponderance of Islam in Hindûstân is is dated. Shahab-ud-deen succeeded to the throne 1203, on the death of his brother (see GHIZNEVIDES). The house of Ghûr had now reached its acme of power, their territory extending from the Caspian Sea to the Bay of Bengal, and from the Jihon to the Indian Ocean. Shahab-ud-deen, having invaded Khaurezm 1204, was attacked by the sultan of that country, and completely routed. In the following year, he undertook an expedition into Kojud, on the s. border of Cashmere, to reduce that rebellious province, in which he had complete success, but on his return was assassinated by one of the Fedayan, or followers of Hussun Sabah, 1206. His nephew, Mahmûd, succeeded; but after a short reign of four years he was assassinated. After his death, some members of the family made feeble efforts to revive the grandeur of their ancestors, but as the sultans of Khaurezm had by this time subjugated the whole Persian empire, their attempts were fruitless.

GIACOMO DA PONTE: see BASSANO.

GIANIBELLI, *jâ-nē-bĕl'lē*, or GIAMBELLI, *jâm-bĕl'lē*, FEDERIGO: born abt. 1530, in Mantua: military engineer. After serving in Italy, he went to Spain and offered his services to Philip II.; but failed to obtain audience of that monarch, and deeming himself slighted, he abruptly quitted Madrid, swearing, as the story goes, that the Spaniards would yet hear of him; and after a residence for some time at Antwerp, where he acquired high reputation as a mechanist, passed over to England and entered the service of the Queen Elizabeth, who granted him a pension. During the War of Independence in the Netherlands, Alexander, Duke of Parma, generalissimo of the Spanish forces, be-

sieged Antwerp, 1585, whereupon Elizabeth commissioned G. to proceed to the assistance of the inhabitants. Finding that the Spaniards had built a vast bridge across the Scheldt, interrupting all communication with the sea, by which alone the city could get provisions or help, G. invented an infernal machine, which he launched against the bridge one stormy night. The effect was frightful. The whole Spanish army was roused by the noise, and the Scheldt was found to be quivering to its lowest depths. The obstructing bridge was blown into the air, and no less than 800 men—among whom were some of the best Spanish officers—were killed. Many Spanish ships also were either burned or sunk. The want of unity, however, among the citizens, ultimately rendered G.'s aid unavailing, and he returned to England, where, at the time of the threatened Spanish invasion, he skilfully fortified the coast-line. When the Armada appeared in the Channel, G. proposed and carried out the plan of sending fire-ships into the midst of the enemy, and in this way greatly contributed to their defeat. After this he disappears from history, and all we know of him is that he died in London.

GIANNONE, *jân-nō'nā*, PIETRO: 1676-1748; b. Ischitella, village of Capitanata, in Naples: historian and lawyer. He early distinguished himself as an able and learned practitioner at the bar of Naples, and soon acquired money enough to enable him to give his time to his favorite historical researches. In the beautiful villa, adjoining Naples, he labored 20 years at his greatest historical work, which, 1723, he published in four vols., under the title *Storia Civile del Regno di Napoli.* This valuable and comprehensive work deals critically with laws, customs, social institutions, and religious influences. Some severe strictures on the spirit of worldly aggrandizement, and progressive corruption of the doctrines and practices of primitive Christianity apparent in the modern Roman Church, so enraged the ecclesiastical party, that G. was universally denounced and anathematized from pulpit and altar. The grossest calumnies were levelled at the great writer, who was finally forced by the popular tempest to take refuge at Vienna. The history was solemnly condemned as heretical and libellous by the pope, and was strictly prohibited. G. was granted a small pension by the emperor Charles VI., under whose dominion Naples then was; but in 1734, G., was deprived of his pension, and returned to Venice, whence he was expelled. He then sought shelter in Geneva. There he composed his famous and bitterest diatribe, *Il Triregno,* against the papal pretensions, and even proclaimed his adoption of the Calvanistic doctrines. Soon, an emissary from the court of Turin, having artfully ingratiated himself into the confidence of G., induced him to enter the Sardinian states, where he was immediately arrested and conducted to the fortress of Turin a close prisoner. G. beguiled his tedious confinement with his chosen studies, and retracted his change of religious opinions, a step which in no way alleviated his persecution. He died a prisoner in the fortress, after 12 years of imprisonment. *La Storia*

Civile has passed through several editions (one at Milan 1823, 13 vols.). A collected edition of his works was published at Turin, 1859. See contributions to his life by Corniani, Parizini, and Fabroni.

GIANT, n. *jī'ănt* [F. *géant*, a giant—from It. *gigante*—from L. *gigan'tem:* Gr. *gigas*, a giant—from *gēgĕnēs*, earth-born—from *gē*, the earth, and *genos*, birth, race]: a man of very large stature (see GIANTS AND DWARFS); a person of great bodily or intellectual power: ADJ. great in size or strength. GI'ANTESS, n. a female giant. GI'ANTLIKE, a. of unusual size. GI'ANTSHIP, n. quality or character of a giant.

GI'ANTS' CAUSE'WAY (named from a legend that it was the commencement of a road to be constructed by giants across the channel to Scotland): a sort of pier or mole, of columnar basalt, projecting from the n. coast of Antrim, Ireland, into the North Channel, about 15 m. from Coleraine. It is part of an extensive and overlying mass of basalt, 300 to 500 ft. in thickness, which covers almost the whole county of Antrim and the e. of Londonderry, extending over nearly 1,200 sq. m. The basalt occurs in several beds, interstratified with layers of ash. It covers secondary strata, converting the chalk into granular limestone, and the lias shale into Lydian stone, where it comes in contact with them. Several of the basaltic beds are more or less columnar, but three are remarkably so. The first appears at the bold promontory of Fair Head; its columns are coarse and large, exceeding 200 ft. in height. The other two are seen together rising above the sea-level at Bengore Head. The lower one forms the Causeway at the place where it is uncovered, as it again gradually dips under the sea. It is exposed for 300 yards, and shows an unequal pavement, formed of the tops of polygonal columns, fitting so compactly that the blade of a knife can scarcely be inserted between them. The columns are chiefly hexagonal, though examples may be found with 5, 7, 8, or 9 sides; and there is a single instance of a triangular prism. The diameter of the pillar is very variable, but the average size is 15 to 20 inches. Each pillar is divided by joints of unequal length, the concave hollow at the end of one division fitting exactly into the convex projection of the other. The rock is compact and homogeneous, and is somewhat sonorous when struck with a hammer.

The Causeway is divided into the Little, Middle and Large Causeways. The Large Causeway, formed by the lowest of the three columnar beds of basalt, is about 30 ft. wide, and runs more than 200 yards from its exposure on the cliff till it is covered by the sea. The Little and Middle Causeways are formed from the second columnar stratum, and are less remarkable than the other.

GIANTS AND DWARFS.

GI'ANTS AND DWARFS: individuals at the opposite extremes of human stature, which ordinarily ranges from little less than four ft. to little more than six feet.

Until the beginning of the present century, it was universally believed that giants, of a size far exceeding those exhibited in our times, formerly existed, either as nations or as individual specimens. This belief was based (1) on the asserted discovery of colossal human bones; (2) on supposed scriptural evidence; and (3) on the evidence of various ancient and mediæval authors.

A reference to the first vol. of Cuvier's *Ossements Fossiles* will show that the bones of elephants, rhinoceroses, mastodons, etc., have been exhibited and accepted as evidence of pre-historic giants. Even so good a naturalist as Buffon fell into this popular delusion, and figured the bones of an elephant as the remains of human giants. Isidore Geoffroy Saint-Hilaire, in his *Histoire des Anomalies de l'Organisation*, notices several of the most famous of these cases. A gigantic skeleton found at Trapani, Sicily, 14th c., was at once pronounced that of the classical giant Polyphemus, and his height was calculated at 300 ft. It was pointed out that the bones differed in form as well as in size from those of man, but this objection was easily met by the question: Why if his height was 50 times as great as that of an ordinary man, should not his form be also different? Many less celebrated giants were subsequently exhumed in Sicily, and the existence of the 'Osseous Caverns,' described by De Quatrefages in *Rambles of a Naturalist*, accounts for such discoveries, at an epoch when few could recognize the differences in form between the bones of an elephant and those of a man. Passing over a giant whose bones were exposed by the action of the Rhone 1456, and whose height was estimated at 30 ft., and another whose skeleton was discovered near Lucerne 1577, and who, according to the calculation of the learned physician Plater, did not exceed 19 ft., we come to the case of King Teutobochus, whose remains were discovered near the Rhone 1613, by a surgeon named Mazurier, whose *Histoire Véritable du Géant Teutobochus* (1618), gave rise to a warm controversy. The anatomist Riolan endeavored to expose the imposture, but the Parisians rushed in crowds to see the bones of a mastodon, which were reported to have been found in a tomb 30 ft. long, bearing the inscription 'Teutobochus Rex.' Britons were not less credulous than their continental neighbors. In 1712, Dr. Mather, in *Philosophical Transactions*, announced the discovery of enormous bones and teeth which had been found in the region now the state of N. Y., and which he regarded as affording evidence of the existence of giants of enormous size in ancient times. The bones were in reality those of a mastodon.

The Scripture evidence, when carefully examined, is not definite. The Hebrew words rendered *giants*, might as well be translated, *rough, cruel, violent*, or *remarkable men;* except the two words *nephilim* and *gibborim*, which occur several times in Genesis: of these *gibborim* means powerful and not necessarily of large stature: and *nephilim*, which doubt-

less in some cases means *giants*, are, as a race, spoken of as swept away by the flood. Nothing is said from which to infer that their size exceeded that of giants now known. The height of Og, king of Bashan, is not given: we are only told the length of his bed; and excluding his helmet, which was probably taken into account in the recorded measurement, Goliath at most, did not exceed eight feet and a half in stature, and consequently was not taller than some giants of modern days.

The classical evidence is abundant, but obviously untrustworthy. Thus Plutarch relates that Serbonius had the grave of Antæus, in the city of Tungis, opened, and 'finding there his body, full 60 cubits long, was infinitely astonished, ordered the tomb to be closed, gave his confirmation to the story, and added new honors to the memory of the giant.' Pliny reports that an earthquake in Crete disclosed the bones of a giant 46 cubits in length, believed by some to be Orion, and by others Otus. Descending to more certain evidence, there is no doubt that a height of between 8 and 9 ft., and probably of more than 9 ft., has been attained. There is a skeleton in the Museum of Trinity College, Dublin, 8 ft. 6 inches in height; that of O'Brien (or Byrne), in the Museum of the College of Surgeons of England, is 8 ft. 2 inches; and that of a giant in the Museum at Bonn, is 8 ft.; and the actual body with the soft parts attached was probably two or three inches longer than the skeleton. (O'Brien, for example, measured 8 ft. 4 inches after his death, as we find recorded in the *Annual Register* XXVI. 209.)

We commonly apply the term *Dwarf* to any organized being, but especially to individuals of the human species, whose height is much less than the average height of their race. Strictly speaking, however, the word should be restricted to those cases in which there is a general and uniform arrest of growth, except, perhaps, in the nervous system, which is often fully developed in dwarfs.

The ancients believed not only in dwarfs of extreme minuteness, but in nations of them. Aristotle, greatest naturalist perhaps that ever existed, declared that the report of trustworthy witnesses testifies to the existence of a minute race of men, with minute horses, living in the caves washed by the waters of the Nile; and Pliny gives various details regarding their habits and their geographical position. Among the extreme cases recorded on ancient authority, is that of Philetas, poet contemporary with Hippocrates, and who was obliged to ballast himself, to avoid being blown away by the wind; that of the Egyptian dwarf mentioned by Nicephorus Calistus, who, at the age of 25 years, did not exceed a partridge in size; and lastly, that of the poet Aristratus, of whom Athenæus records that his stature was so small that *no one could see him.*

As to remarkable dwarfs of modern times.—readers of *Peveril of the Peak* remember Sir Geoffrey Hudson. Till the age of 30, his height was only 18 inches; from that age, he rapidly grew to the height of 3 ft. 9 inches. He had an enormous head, and large hands, but in other respects

was well proportioned: he died at the age of 63. Count Joseph Borowlaski was the son of well-formed healthy parents of the ordinary size, who had six children, of whom the first, third, and fifth were dwarfs. Joseph, who wrote a history of his own life, records that his eldest brother was 3 ft. 6 inches high; then came a son who was 5 ft. 10 inches; then Joseph himself, whose height at 20 was 2 ft. 4 inches, and at 30, 3 ft. 3 inches. He was succeeded by three others, the middle one a girl, who died at 22 of the small-pox, being then 2 ft. 2 inches, but of admirable proportions. Joseph Borowlaski was very well proportioned, was married to a woman of ordinary size, who brought him several well-formed children, and died at Banks Cottage, near Durnham, 1837, at the age of 98—a great age for an ordinary man, and without parallel in the history of dwarfs. Nicholas Ferry, commonly known under the name of Bébé, was a celebrated dwarf. His parents and his brothers and sisters were all well-formed persons. He was a seven month's child, and at birth measured less than eight inches, and weighed less than a pound. When five years old, a physician, who examined him, reported that he then weighed 9 lbs. 7 ounces, and stood 22 inches high, but was formed like a young man of 20. He died in his 23d year, being then under three ft. high. (Humphry, *On the Human Skeleton*, p. 101.) In the Museum of the Faculté de Médecine of Paris, there is a wax-model which represents him at the age of 18; and in the Muséum d'Histoire Naturelle is his skeleton, which in the complete ossification of the bones, and in the disappearance of the cranial sutures, resembles that of an aged person. According to C. G. Carus (*Symbolik der menschlichen Gestalt, Zweite Auflage*, 1858, p. 83), 'General Tom Thumb,' the well-known dwarf, exhibited by P. T. Barnum, was 25 inches in height, and weighed 25 pounds: His real name was Charles Heywood Stratton, b. Bridgeport, Conn. 1838; d. 1883; he was married to Lavinia Warren, 1863, also a minute specimen of humanity: a companion dwarf, 'Commodore' Nutt, was exhibited with these two. Prince Colobri, a Slesvig dwarf, exhibited in Dresden 1851, was of similar height and weight to 'Tom Thumb,' his age being 21 years. Carus examined likewise in 1857, a Dutch dwarf, who took the name of Tom Thumb, was aged 18 at the time of examination, and measured about 2 ft. 4 inches. (These are probably Prussian measures, which slightly exceed those of this country.)

On comparing the *data* in our possession regarding giants and dwarfs—and for most of these *data* we must refer the reader to Geoffroy Saint-Hilaire's *Histoire des Anomalies*—it appears (1) That giants are of rarer occurrence than dwarfs: (2) That giants are usually of a lymphatic temperament, and of a very delicate complexion, often deformed, and almost always badly proportioned; that their muscles are flabby, and their voice weak; while dwarfs are often perfectly well-proportioned, and are strong for their size: (3) That giants are never long-lived—O'Byrne died at 22 years, Magrath at 20—while dwarfs seem to attain the full ordinary period of human existence—Borowlaski died at

98, Hudson at 63: and though we do not know the age at which Therese Souvray—a dwarf described by Virey—died, we know that at the age of 73, 'elle était encore vive, gaie, bien portant, et dansait à la mode de son pays:' (4) That while giants usually show lack of activity and energy, and are feeble both in body and in mind, dwarfs are in general lively, active, and irascible (Borowlaski in his memoirs gives a good illustration of the last characteristic, as exhibited by the dwarf Bébé. 'When he perceived that the king took pleasure in my society, he conceived the most violent jealousy and hatred of me . . . . and endeavored to push me on to the fire;' and Sir Geoffrey Hudson's irascibility is well depicted in *Peveril of the Peak*). That the intellectual powers of dwarfs is sometimes considerable, is sufficiently evidenced in the cases of Borowlaski, General Tom Thumb, and the Dutch Tom Thumb, who, according to Carus, spoke four languages.

We know little of the causes which occasion the excessive development or the arrested growth on which the production of giants and dwarfs depends. Bp. Berkeley (died 1753) is said to have attempted with considerable success to manufacture a giant. (Our authority for this statement is Geoffroy Saint-Hilaire, who quotes Watkinson's *Philosophical Survey of Ireland*, Lond. 1777). He took a poor orphan, named Magrath, and reared him on certain hygienic principles (Virey conjectures that he fed him with mucilaginous foods and drinks, but nothing seems known on this point), which were so far successful that, at the age of 16, he was 7 ft. in height, and at the time of his death, which occurred, with all the symptoms of old age, at the age of 20, he was 7 ft. 8 inches high.

Geoffroy Saint-Hilaire devotes a special section of his book to the 'causes of dwarfism,' but he arrives only at the general conclusion, that in these cases there is an obstacle to the proper nutrition and development of the fetus; that this obstacle may be due either to something wrong in the maternal organism, or more commonly to some disease affecting the fetus itself; and that this disease is usually rachitis or rickets.

Mythological Giants and Dwarfs.—Giants play a part in the mythology of almost all nations of Aryan descent. The Greeks, who represented them as beings of monstrous size, with hideous countenances, and having the tails of dragons, placed their abode in volcanic districts, whither they were fabled to have been banished after their unsuccessful attempt upon heaven, when the gods, with the assistance of Hercules, imprisoned them under Ætna and other volcanoes. Their reputed origin, like the places of their abode, points to the idea of the mysterious electrical and volcanic convulsions of nature, which they obviously typify; and, in accordance with this view, they are said to have been of mingled heavenly and earthly descent, and to have sprung from the blood that fell from the slain Ouranos upon the earth, Ge, which was their mother. In the cosmogony of the northern nations, giants occupy a far more important place than the Greeks assigned to them, for here

the first created being was the giant Ymir, called also 'Aurgelmir,' 'or the ancient Chaos,' the progenitor of the Frost-giants (Hrimthursar), among whom dwelt the All-Father before the creation of heaven and earth. The mode of origin of Ymir was as follows: In the beginning of time a world existed in the north, called Niflheim, in which was a well, Hvergelmir, whence issued a poisonous stream which hardened into ice, the accumulation of which formed the northern part of Ginnungagap, or abyss of abysses, whose southern extremity was radiant with the heat and light which emanated from another world, known as 'Muspelheim.' The meeting of heat and ice produced drops, which, through the agency of the same creative power (the All-Father) which had sent them forth, received life and a human form. This was Ymir, who was nourished from four streams of milk, which flowed from the cow, Audhumla, or the nourishing power, which had been created by Surt, the guardian watch of Muspelheim. While Ymir slept, a man and woman grew from under his left arm, and a son was produced from his feet. In course of time other beings were generated from the salt and frost-covered stones which the cow Audhumla licked, and from these were born three brothers, Odin, Vili, and Ve, who were gods, and who, having slain Ymir, and dragged him out into the middle of Ginnungagap, formed from his blood the sea and all waters, and from his huge body heaven and earth and all solid things in nature.

With Ymir perished all the frost-giants except Bergelmir, who, with his wife, escaped on a chest or drum, and became the father of the new giant dynasty of the Jötuns. The gods formed, however, of the eyebrows of Ymir, a wall of defense against these giants, who thenceforward dwelt in Jötunheim, beyond the boundaries of the ocean, which encircled Midgard, the future abode of the sons of men. The Æsir or gods lived in their own city, Asgard, occupying themselves with works of industry till they were corrupted by the giantesses who came to them from Jötunheim, when the Golden Age ceased, and discord arose among the gods. At the instigation of the maidens from Jötunheim, the gods created dwarfs and men; the former from the maggots generated within the body of Ymir, and the latter from trees; and from this time the giants gradually lost their power, under the united opposition of gods and men.—In the popular belief, common in all countries, that through the agency of giants mountains and islands have arisen, and rocks and mountains have been hurled from their original sites, we trace the ideal personification of the forces of nature, which after long periods of repose, burst into sudden and uncontrollable violence; thus giants were represented as good-humored and complacent when at rest, but implacable, savage, and treacherous when excited; while they were at all times impressed with a consciousness that, notwithstanding their huge bulk, and the excess of heads and arms with which many of them were supplied, they were but stupid monsters, unable to cope with the ready wit and keen intelli-

gence of divine or even human beings, to whom they believed it was the decree of fate that they must ultimately succumb. In this respect, the giants typify the heathen element in its conflict with Christianity, and northern Sagas are rife with the histories of gigantic, wild, and cruel races, known as *Thursar* (Goth. *thaursjan*, to thirst); or *Jötnar* (Anglo-Saxon *etan*, to eat), who ate and drank voraciously, and subdued all things to their sway, until there came from the far East a people, who knew and worshipped the god of the universe under the name of the 'All-Father,' and who, by their greater skill, overcame the savage giants of the north, and compelled them to withdraw more and more into the recesses of the forests and mountains, whence they emerged only from time to time in the form of mountain trolls and giants. See SCANDINAVIAN MYTHOLOGY.

The *dwarfs* who figure in the *Eddas* as cunning and crafty elves, skilled in magic and in the working of metals, are conjectured to have been a race of Oriental Lapps, who immigrated into Sweden and Norway later than the Finns, who were the descendants of the giants, and therefore the oldest of the races that now occupy the Scandinavian peninsula. When considered under the broadest signification of the term, dwarfs (Goth. *dvairgs*, which Grimm conjectures may be identical with the Greek *theourgos*, one who does supernatural works) typify the transition from inorganic to organic nature, and thus personify the subordinate powers of nature; and under this idea they are represented as assisting men by combining the primary ores into new mineral bodies, and fostering the development of fruits and seeds. Considered from this point of view, they occupy an intermediate position between giants and men; and while they fear both, they incline to serve the latter at the expense of the former, and thus appear under the form of beneficent elves (q.v.), fairies, and brownies (q.v.). During the latter part of the middle ages, when the traditionary folk-lore of w. Europe was being supplanted by the literature of the monks, mainly legends of saints, the devil and the fallen angels took the place, in the minds of the illiterate, that had hitherto been occupied by giants and dwarfs; and the various supernatural feats of strength which had in earlier ages been ascribed to these imaginary beings, were attributed to Satan and his attendant spirits, or in some cases to the saints of the church.—See Grimm's *Deutsche Mythologie*, Thorpe's *Northern Mythology*, Grundtvig's *Nordens Mythologie*, and Petersen's *Nordisk Mythologie*.

GIAOUR, n. *jowr* or *gē-owr'* [Turk. *giaour;* Pers. *gawr*, an infidel]: term of reproach or contempt applied by the Turks to all unbelievers in Mohammedanism, but especially to Christians (see GUEBERS). Its signification has been modified, so that it now in many cases is a mere distinctive epithet without intention of reproach.—Giaour was the title of a poem of Lord Byron, published 1813.

GIARRE, *jär′rā:* town of Sicily, province of Catania, on the slope of Mount Etna. The surrounding district is famous for its vineyards and the quality of their produce. The port is Riposto, about a mile distant. Pop. of Giarre about 8,000.

GIB, or GIB-CAT, n. *gĭb* [a contraction of *Gilbert* = F. *Thibert,* in same sense, viz., name for a male cat, as *tom-cat* now is]: a he-cat; an old male or tom-cat.

GIB, n. *jĭb* [the same root as JIB, which see]: something which projects and swings loose; a raised or prejecting thing; the lower jaw of a horse as projecting and movable. *Note.—giblets,* loose projecting parts; *gibbet,* that which can swing up into the air; *jib,* the foremost sail, the projecting part of a crane, and *gib,* have a common origin.

GIB and KEY, *jĭb* [*gib,* cat or male cat (see GIB 1)]: in *steam machinery,* the fixed wedge, and the driving wedge, for tightening the strap which holds the brasses at the end of a connecting rod; a piece or slip in a machine, or any kind of structure to hold parts together, or keep them in place: V. to secure or fasten with gibs. GIB′BING, imp. GIBBED, pp. *jĭbd.*

GIBBER, v. *gĭb′bėr* [imitation of the sound of rapid talking without reference to meaning: Icel. *gifra,* to jabber: comp. Gael. *gob* or *gab,* the mouth]: to speak inarticulately; to gabble. GIB′BERING, imp. GIB′BERED, pp. *-bėrd.* GIB′BERISH, n. *-bėr-ĭsh,* unmeaning words; unintelligible language: ADJ. canting; unintelligible.

GIBBER, n. *gĭb′bėr* [L. *gibber,* crook-back, hunch-backed]: in *bot.,* a pouch at the base of a floral envelope: see GIBBOSE.

GIBBES, ROBERT WILSON, American scientist and historian: b. Charleston, S. C., 1809, July 8; d. Columbia, S. C., 1866, Oct. 15. He was graduated from South Carolina College in 1827, from the Medical College of South Carolina in 1830. In 1827–35 was assistant professor of chemistry, geology, and mineralogy in the South Carolina College, and in the Civil War was surgeon-general of South Carolina. His contributions to science appeared in the *Journal* of the Academy of Natural Science, and other learned publications. His paper on *Typhoid Pneumonia,* (*American Journal of Medical Sciences,* 1842) was the first to urge the substitution of stimulants for the knife in the treatment of that disease. He published: *Documentary History of the American Revolution* (1853 et. seq.).

GIBBET, n. *jĭb′bĕt* [F. *gibet,* a jibbet: OF. *gibbet,* a large stick: Dut. *wippen;* Sw. *jippa,* to jerk up into the air]: a gallows on which the bodies of criminals who have been guilty of particularly atrocious crimes were suspended after execution, encased in an iron frame, near the spot where the crime was committed. This was done for the purpose of striking terror into the evil-minded, and of affording 'a comfortable sight to the relations and

friends of the deceased.' The practice, first recognized by law in Great Britain in 1752, was abolished in 1834. V. to hang or expose on a gallows; to expose to public scorn and execration as if a criminal on a gibbet. GIBBETING, imp. GIB'BETED, pp. See HANGING.

GIBBON, *gĭb'bŏn* (*Hylobates*): genus of apes, or tailless monkeys, native of the E. Indies. They are nearly allied to the orangs and chimpanzees, but are of more slender form, and their arms so long as almost to reach the ground when they are placed in an erect posture; there are also naked callosities on the buttocks. The canine teeth are long. The gibbons are inhabitants of forests, their long arms enabling them to swing themselves from bough to bough, which they do to wonderful distances, and with

White-handed Gibbon (*Hylobates albimana*).

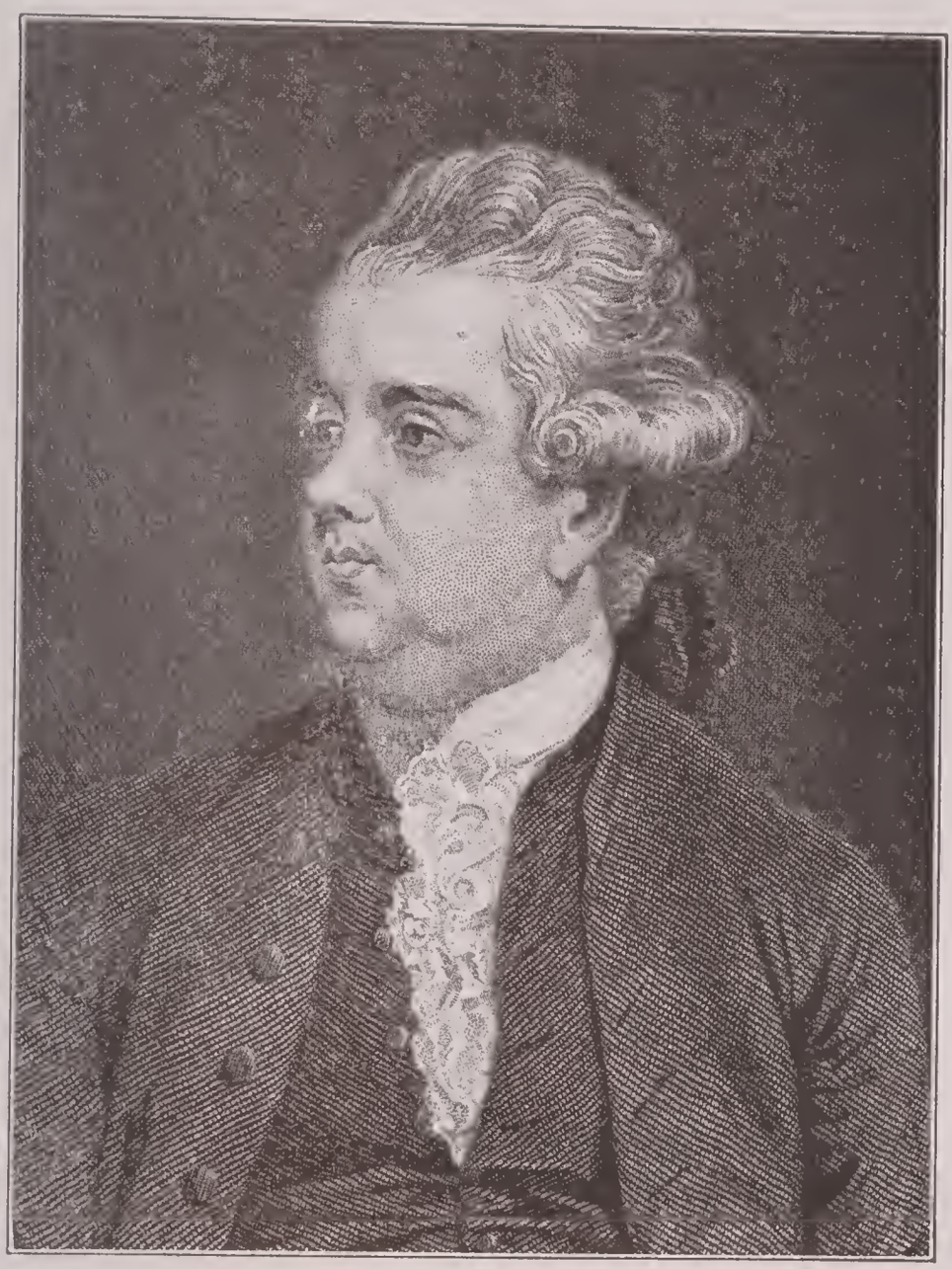
extreme agility. They cannot, however, move with ease or rapidity on the ground. The comformation of the hinder extremities adds to their difficulty in this, while it increases their adaptation to a life among the branches of trees, the soles of the feet being much turned inward. None of the gibbons are large. The COMMON GIBBON, or LAR GIBBON (*H. lar*)—black with a border of gray hair around the face—is found in some parts of India, and in more eastern regions. The WHITE-HANDED GIBBON (*H. albimana*)—black, the face bordered with gray, and the four hands white—is a native of Sumatra. The ACTIVE GIBBON (*H. agilis*), found in Sumatra, is particularly remarkable for the power of flinging itself from one tree to another, clearing at once, it is said, a distance of 40 ft. The WOW-WOW (*H. leuciscus*) is a gibbon found in Malacca and the Sunda Isles. The HOOLOCK (*H. Hoolock*) is a native of the Garrow Hills. The SIAMANG

(*H. syndactyla*), a Sumatran species, differs from the rest of the genus in having the first and second fingers of the hinder extremities united to the second joint. All the gibbons are of gentle disposition, and easily domesticated.

GIBBON, *gĭb'on*, EDWARD: historian of *The Decline and Fall of the Roman Empire:* 1737, Apr. 27 (O. S.)—1794, Jan. 16; b. Putney, England; first child of Edward Gibbon and Judith Porten, both of good family; the only one of seven children that survived infancy. Memoirs of his *Life and Writings* were written by himself, and these, with his letters and other miscellaneous works were published after his death by his friend Lord Sheffield, with whom he had long carried on a most confidential correspondence. Few autobiographies are so interesting as that of Gibbon, and none more veracious. It is a self-portraiture, both in regard to what is said and in regard to the manner in which it is said—his pride, self-complacency, integrity, and contempt for the contemptible, and much beside, being all clearly revealed as proposed by him with 'truth, naked unblushing truth.' He reflects: 'My name may hereafter be placed among the thousand articles of a Biographia Britannica; and I must be conscious that no one is so well qualified as myself to decribe the series of my thoughts and actions.' So, in his 52d year, after he had finished his 'arduous and successful work,' he proceeded to do it. Like most thinkers, his actions were few, and apart from his thoughts and the growth of his mind quite unimportant. He spent a sickly childhood in occasional lessons and desultory reading and discussion with his mother's sister, a lady of strong understanding and warm heart, whom he calls 'the mother of his mind,' and to whose kindness he ascribes not only the bringing out of his intellectual faculties, but the preservation of his life in these critical early years. One of his temporary masters was the Rev. Philip Francis, translator of Horace. His father, who seems to have been the somewhat impulsive possessor of the wreck of a fortune, had him entered at Magdalen College, Oxford, at the age of 15, when he was very imperfectly prepared for this crisis; his extensive reading and interrupted education having produced 'a stock of erudition that might have puzzled a doctor, and a degree of ignorance of which a schoolboy would have been ashamed.' Here he spent 14 idle months, the chief result of which was, that in his incursions into controversial theology he became a convert to the Catholic Church, and found himself shut out from Oxford. He was by his father placed under the care of Mallet the poet, and a deist, but by his philosophy the young enthusiast was 'rather scandalized than reclaimed.' He was sent to Lausanne, in Switzerland, to board in the house of M. Pavillard, a Calvinist minister, a poor but sensible and intelligent man, who judiciously suggested books and arguments to his young charge, and

had the satisfaction of seeing him reconverted to Protestantism, in witness of which conversion he received the sacrament in the church of Lausanne on Christmas Day 1754. He lived nearly five years in this house, respecting the minister, and enduring with more or less equanimity the 'uncleanly avarice' of his wife; and it was here that he began, and carried out steadily and joyously to an extent that will astonish very hard students, those private studies which, aided by his enormous memory, made him a master of erudition without a superior, and with hardly an equal. Here also he fell in love with Mademoiselle Susan Curchod, daughter of a clergyman, a young lady beautiful and learned, who afterward became the wife of M. Necker, distinguished French minister and financier. Gibbon's father disapproved of this alliance, and he yielded to his fate. After his return to England and his father's house, he persevered in his studies as he best could.

He finished a little work in French, begun at Lausanne, and published it under the title of *Essais sur l'Étude de la Littérature*, 1761. In the same year he became captain in the Hampshire militia, in which he continued for two and a half years. Of this part of his career he observes: 'The discipline and evolutions of a modern battalion gave me a clearer notion of the phalanx and the legion; and the captain of the Hampshire grenadiers (the reader may smile) has not been useless to the historian of the Roman Empire.' The militia being disbanded, he revisited the continent, and travelled into Italy; and among the benefits of foreign travel, he notes its influence in suggesting the work of his life in these words: 'It was at Rome, on the 15th of October 1764, as I sat musing amidst the ruins of the capitol, while the bare-footed friars were singing vespers in the temple of Jupiter, that the idea of writing the decline and fall of the city first started into my mind.' His plan, originally circumscribed to the decay of the city, grew by years of reading and reflection and delay to embrace the empire. During these years his father died, leaving his affairs deranged, and he entered parliament for the borough of Liskeard at the beginning of the struggle with America, 'and supported with many a sincere and silent vote the rights, though not, perhaps, the interest, of the mother country.' He sat eight years, but never had courage to speak; 'the great speakers filled him with despair, the bad ones with terror.' In 1776, the first vol. of *The Decline and Fall* was published, and its success was prodigious. The reputation of the author was established before the religious world had had time to consider and attack the last chapters of the work—the 15th and 16th—in which, while admitting, or, at least, not denying, the 'convincing evidence of the doctrine itself, and the ruling providence of its great author,' he proceeds to account for the rapid growth of the early Christian church by 'secondary' or human causes. Hume, who was then slowly dying, in a highly complimentary letter,



GIBBON.

told him in regard to these chapters: 'I think you have observed a very prudent temperament; but it was impossible to treat the subject so as not to give grounds of suspicion against you, and you may expect that a clamor will arise.' The prophetic criticism was correct; the grounds of the 'clamor' being, at the best, only strong suspicions that, in becoming a convert from Catholicism to Protestantism, Gibbons had, like Bayle, gone on 'to protest against all sects and systems whatsoever.' That he did not like to see the barefooted friars in the temple of Jupiter is clear enough all through the six large and compact volumes of his history. He finished this great work 1787, June 27, at Lausanne, to which he had retired for quiet and economy after leaving parliament, and holding office under government for a short time. In his *Memoirs*, he tells the hour of his release from his protracted labors—between eleven o'clock and midnight—and records his first emotions of joy on the recovery of his freedom and the sober melancholy that succeeded it, all in a style and in a connection which, with much beside, must be studied in his own pages by those who would know Gibbon in his real greatness, self-complacency, egotism, and contemplative sadness. The lady of Lord Sheffield, his close friend, having died, Gibbon left Lausanne for England to console him; and about six months after his arrival, he died without apprehension or suffering, in St. James Street, London, of an enormous rupture and hydrocele, which, as it gave him no pain, he had allowed to grow neglected without speaking of it to either friend or physician for thirty-two years.

In person, Gibbon became very corpulent, and the small bones of the big-headed delicate boy were in after years hardly adequate to sustain their load. Vanity was, perhaps, his only frailty. He affected the manners of the fine gentleman of the 18th century to the end, and they adjusted themselves grotesquely to the unwieldly body and the massive mind.

It is not easy to characterize a man of so gigantic and cultivated an intellect in few or many phrases. He was a faithful friend, pleasant and hardly rivalled in conversation, not disliked by any one who came near him. His *Decline and Fall* is probably the greatest achievement of human thought and erudition in the department of history; at least Niebuhr gives it this high praise. It is virtually a history of the civilized world for 13 centuries, during which paganism was breaking down and Christianity was superseding it; and thus bridges over the chasm between the old world and the new. Its style is marked by the highest power of condensation, and is full of smiting phrases and ponderous antithesis. Byron designates him

'The lord of irony, that master-spell.'

He himself was not unaware of this part of his genius, and he says he cultivated it by reading the *Provincial Letters* of Pascal every year; which must have become eventually a mere form, for two careful readings sufficed to fix al-

most any composition indelibly on his impressible and retentive memory. His accuracy in regard to fact has never been successfully impeached, and his industry has never been questioned. The best edition of *The Decline and Fall* is that of Prof. J. B. Bury (1896-1900), which has been annotated and revised with the results of research not available in Gibbon's day.

GIBBONS, *gĭb'onz*, GRINLING: 1648-1721, Aug. 3; b. Rotterdam; d. London: English sculptor and wood carver. On the recommendation of Evelyn, he was, by Charles II., appointed to a place in the board of works, and employed in the ornamental carving of the choir of the chapel at Windsor. For the choir of St. Paul's, London, he executed the foliage and festoons, and those in lime-tree which decorate the side-aisles. In marble and bronze he produced the statue of James II., behind the banqueting hall, Whitehall; of Charles I., at Charing Cross; and of Charles II., at the Bank of England. The wooden throne at Canterbury; the monument of Viscount Camden at Exton; and the baptismal font at St. James's Church, London, are by him.

GIBBONS, *gĭb'onz*, JAMES, D.D: Cardinal Archbishop of the Rom. Cath. Church: b. Baltimore, 1834, July 23. He was educated partly in Ireland and partly in St. Mary's Seminary, Baltimore; was ordained priest 1861, June 30, was appointed by Abp. Spalding private sec. and chancellor of the archdiocese, became asst. chancellor of the second plenary council of the American Rom. Cath. Church 1866, was appointed vicar apostolic of N. C. with the rank and title of bp. 1868, and was translated to the vacant see of Richmond 1872. In 1877 he was appointed coadjutor to Abp. Bailey of Baltimore, and on the death of the latter, Oct. of that year, he succeeded to the vacant and oldest see in the United States. Pope Leo XIII. summoned him to Rome to confer on church matters in the United States 1883, appointed him pres. of the third plenary council of Baltimore 1884; and raised him to the dignity of cardinal archbishop. His investiture occurred 1886, June 30. He has been chancellor of the Catholic University, Washington, D. C., since its foundation, 1888, and is president of the Bureau of Catholic Indian Missions. He wrote *The Faith of Our Fathers; Our Christian Heritage;* and *The Ambassador of Christ.*

GIBBONS, JAMES SLOANE: an American banker; 1810, July 1—1892, Oct. 17. He became a strong abolitionist many years prior to the Civil war. During the draft riots in New York (1863) his house was sacked because he had illuminated it in honor of Abraham Lincoln. He will be remembered because of his song, popular during the war, *We are coming, Father Abraham, Three Hundred Thousand More.*

GIB'BONS, ORLANDO, MUS.D.: 1583-1625; b. Cambridge: English musician. At the age of 21, he became organist of the Chapel Royal. He was the best church

CARDINAL JAMES GIBBONS.

composer, and, according to Anthony Wood, 'one of the rarest musicians of his time.' His madrigals have always been popular. Of these, three, *Dainty Sweet Bird, O that the Learned Poets,* and *The Silver Swan,* are considered far superior to most compositions of the kind. He composed the music for the marriage-ceremonial of Charles I., 1625; but while attending it officially, he caught the smallpox, and died at Whitsunday thereafter. A monument to his memory, erected by his wife over his burial-place in Canterbury Cathedral, is still shown. His anthems, *Hosannah to the Son of David! Almighty and Everlasting God!* and *O Clap your Hands together!* are reckoned by Wood 'masterpieces of the most ingenious and scientific writing in fugue that musical skill ever brought forth.'—His two brothers, EDWARD GIBBONS, organist of Bristol, and ELLIS GIBBONS, organist of Salisbury, likewise were good musicians. Edward, sworn in a gentleman of the Chapel Royal 1604, was master to the famous composer Matthew Lock. During the civil wars Edward lent Charles I. £1,000, for which he was afterward deprived of a considerable estate, and, with his three grandchildren, thrust out of his house at a very advanced age. In the *Triumphs of Oriana* are two madrigals by Ellis Gibbons.—Gibbons's son, Dr. CHRISTOPHER, at the Restoration, was appointed principal organist to the king and to Westminster Abbey, and by a recommendatory letter from Charles II. was created doctor in music by the Univ. of Oxford. Celebrated for his organ playing, he is said to have been the instructor on that instrument of Dr. John Blow (d. 1708), well known composer of the pieces published under the title *Amphion Anglicus.*

GIB'BONS, WILLIAM, M.D.: 1781, Aug. 10—1845, July 25; b. Wilmington, Del.: Quaker editor and author. He graduated in medicine at the Univ. of Penn. 1805, and passed his life in his native place. While practicing his profession he became eminent as a linguist, scholar, and nurseryman, pres. of the Del. Acad. of natural sciences, of the Peace Soc., and the Del. Temperance Soc.; and member of the soc. for preventing the kidnapping of colored people. In 1821 he presented a clear exposition of Quaker doctrines in replying to an attack by a Presb. clergyman on the Soc. of Friends, and 1824-28 conducted at his own expense *The Berean,* a religious publication devoted to the defense of the Friends. He was active in the controversy that led to the separation of the Soc. of Friends into two bodies, was an advocate of evangelical views, and published *Exposition of Modern Scepticism.*

GIBBOSE, a. *gĭb-bōs'* [L. *gibbus,* humped: It. *gibbo,* a swelling on the back: F. *gibbeux,* a branching out—from mid. L. *gibbōsus,* hunched]: humped; a term applied to surfaces having large elevations. GIBBOS'ITY, n. *-bŏs'ĭ-tĭ,* a round or swelling prominence; a state of disease characterized by protuberance of a part of the body; applied chiefly to humpback or other distortions depending on disease (rickets, q.v.) of the spinal column; in *bot.,* a swelling at

the base of an organ. GIBBOUS, a. *gĭb'bŭs*, swelling; protuberant; swollen at the base, or having a swelling on the surface; convex, applied to bodies which are doubly-convex, particularly to the moon in her second and third quarters. GIB'BOUSLY, ad. *-lĭ*. GIB'BOUSNESS, n.

GIBBS, *gĭbz*, ALFRED: 1823, Apr. 22—1868, Dec. 26; b. Sunswick, L. I.: soldier. He graduated at the U. S. Milit. Acad. 1846, was wounded in the Mexican war, and brevetted 1st lieut. and capt. for gallantry, took part in the campaigns against the Apache and Navajo Indians, was commissary at Albuquerque, N. M., 1860-1, promoted capt. 1861, May, taken prisoner by the Confederates, San Augustine Springs, N. M., 1862, Aug. 27, and paroled, and was appointed col. of the 130th N. Y. vols. 1862, Sept. 6. He reorganized his regt. as the 12th N. Y. dragoons 1863, commanded a reserve brigade of cav. 1864-5, and was engaged in Sheridan's chief cav. raids. In 1864, Oct., he was promoted brig.gen. of vols., 1865 commanded a brigade in the pursuit of the army of n. Va., 1865, Mar., was brevetted maj.gen. U. S. A., 1866, Feb., mustered out of the vol. service, and July 28 appointed maj. 7th U. S. cav., serving with it till his death.

GIBBS, GEORGE, American mineralogist: b. Newport, R. I., 1782, Jan. 8; d. Newtown, N. Y., 1833, Aug. 5. Early becoming interested in the study of mineralogy, he collected during his travels in Europe, chiefly by purchase, a very extensive and valuable cabinet of minerals, the most extensive at the time that had been brought together in the United States. This collection he set up in the public rooms of Yale College, where it remained without charge from 1811-25 and in the latter year it was purchased for the college for $20,000.

GIBBS, JAMES EDWARD ALLEN, American inventor: b. 1820, Aug. 1; d. Raphine, Rockbridge County, Va., 1902, Nov. 25. While a young man the subject of the sewing-machine was called to his attention, and presently he thought out the idea of the revolving hook which is the main feature of the Wilcox & Gibbs machine. In all he took out 12 patents covering the sewing-machine. The village in which he resided was named by him when he returned to it in middle life. The name is from the Greek word which means 'to sew.'

GIBBS, JOSIAH WILLARD, American philologist: b. Salem, Mass., 1790, April 30, d. New Haven, Conn., 1861, March 25. He was graduated at Yale College in 1809, and in 1824 was appointed professor of sacred literature in the theological department of Yale College, which he held till his death. He published a translation of Gesenius' *Hebrew Lexicon of the Old Testament* (1824); *Manual Hebrew and English Lexicon*, abridged from Gesenius (1828); *Philological Studies* (1857); *Latin Analyst* (1858), etc., and contributed to the periodical works of his time numerous important papers on topics of philology and criticism.

GIBBS, Josiah Willard, American mathematician: b. New Haven, Conn., 1839, Feb. 11, d. there 1903, April 28. He was a son of the preceding and was graduated from Yale in 1858. He was professor of mathematics at Yale in 1871 and held the position at the time of his death. Thermodynamics was the field in which he achieved his greatest renown. He was original in his manner of teaching and extremely successful in the class-room. The work that brought him first into prominent notice was his treatise on the *Equilibrium of Heterogeneous Substances*, published in 1875 by the Connecticut Academy of Arts and Science. His last contribution on this subject was his book in the Bi-Centennial series at Yale, entitled *An Elementary Treatise on Statistical Mechanics*, wherein he set forth what are likely to be the foundations of this branch of science in the future. In 1881 he began the development of the Vector analysis and applied it to problems in crystallography and to the computation of the orbits of the planets and comets and also to problems in the theory of light. His work gave strong support to the electromagnetic theory and powerful influence in securing a general adoption of this theory by physicists.

GIBBS, Oliver Wolcott, M.D., LL.D.: chemist: b. New York, 1822, Feb. 21. He graduated at Columbia College 1841, and the College of Physicians and Surgeons 1845, spent two years studying chemistry in Berlin, Paris, and Giessen; was prof. of physics and chemistry in the College of the City of New York 1849-63, and in the latter year was elected Rumford prof. of chemistry in Harvard Univ., which office he held for 24 years, and is now prof. Emeritus. He was a member of the executive committee of the U. S. Sanitary Commission during the civil war, a founder, president National Acad. of Sciences, vice-pres. of the American Assoc. for the advancement of Science, 1866-67, and commissioner of the Vienna exhibition 1873. He received the degree of LL.D. from Columbia College 1873.

GIBBSITE, n. *gĭbz′īt* [from Col. George *Gibbs*, original owner of the mineralogical cabinet in Yale Univ.]: hexagonal or monoclinic white, grayish, greenish, reddish-white, or reddish-yellow, translucent mineral, emitting, when breathed upon, an argillaceous smell; found in the Ural Mts. and in various places in the United States.

GIBE, n. *jīb* [W. *gwep*, beak, face: Norw. *gjeipa;* Sw. *gipa*, to wry the mouth, to make faces: Icel. *jeip*, idle talk: comp. Gael. *geob*, a wry mouth]: an expression of sarcastic scorn; a scoff; a railing; a sneer: V. to cast reproaches and sneering expressions at: to rail at; to taunt; to scoff. Gī′bing, imp. Gibed, pp. *-jībd.* Gī′ber, n. *-bėr* one who. Gī′bingly, ad. *-lĭ.*—Syn. of 'gibe, v.': to rail; flout; fleer; deride; jeer; sneer.

GIBEAH, *gĭb′ĕ-ah* [Heb. signifying a 'hill']: name of several towns and places in anc. Palestine. The only one specially notable is *Gibeah-of-Benjamin*, small city about

four m. n. of Jerusalem; the residence, probably the birthplace, of King Saul. Gibeah-of-Benjamin has been identified with the modern village of *Tuleil el-Fûl.*

GIBEL, *gĭb'ĕl* (*Cyprinus gibelio*): fish of the same genus with the carp, but of the division of the genus destitute of barbules of the mouth, by which it is easily distinguished from the carp, while from the crucian it is at once distinguished by its forked tail. The weight is seldom much more than half a pound, though specimens have been caught of two lbs. weight. The gibel is common in parts of continental Europe; it is supposed to have been introduced into England from Germany, but it is now fully naturalized in ponds near London and in many other parts of the country. It is generally known in England as the Prussian carp. It is a good fish for the table, but affords little sport to the angler, seldom taking any bait readily. It feeds partly on aquatic plants, partly on worms and mollusks. It is very tenacious of life out of the water, and has been known to recover after 30 hours.

GIBEON, *gĭb'ĕ-on* [Heb. 'belonging to a hill'] celebrated city of anc. Palestine, about 5 m. n.w. of Jerusalem. At the conquest of Canaan by the Israelites under Joshua, it was inhabited by the Hivites. By a clever stratagem, the Gibeonites insured the alliance and protection of the invaders, and so escaped the fate of Jericho and Ai; but their deceit being afterward found out, they were reduced to a condition of servitude, being appointed 'hewers of wood and drawers of water unto all the congregation. When the five kings of the Amorites besieged Gibeon, on the ground of its having entered into a traitorous compact with the Israelites, the common enemy of all the Canaanites, Joshua hastened to its help, and overthrew the besiegers with great slaughter. The battle was attended, we are informed, with supernatural phenomena—viz., the standing still of the sun upon Gibeon, and of the moon in the valley of Ajalon; but as the passage where this occurs (Joshua x. 13) is immediately followed by these words: 'Is not this written in the book of Jasher?' some have chosen to think that it may perhaps be only an extract from that collection of national songs; and the fact of its forming two hemistichs, while the rest of the narrative is in prose, tends to favor this theory, resolving the miracle into a hyperbole of oriental poetry. While this view may be conceded as possible or even probable, the need of it in exegesis is not generally felt among Christian scholars. The city of Gibeon is mentioned various times in the history of David and his captains; but its sanctity, in the eyes of the Jews, arose from the fact of it—or the hill near it—having been for a time the seat of the tabernacle of the congregation, and the brazen altar of burnt-offering. It was at the horns of this altar that the ruthless Joab was slain by Benaiah, son of Jehoiada; and here Solomon, in the beginning of his reign, with magnificent ceremony sacrificed a thousand burnt-offerings.

GIB'LAH: see BYBLOS.

GIBLETS, n. plu. *jĭb'lĕts* [OF. *gibelei*, the old form of F. *gibelotte*, stewed rabbit: comp. Gael. *giblion*, the entrails of a goose or fowl fit for food; *giaban*, a fowl's gizzard. It. *gibbo*, a hump]: the parts of a goose or of poultry, as the heart, liver, gizzard, cut off before it is dressed. GIB'LET, a. made of giblets. GIBLET-PIE, a pie made of giblets.

GIBRALTAR, *jĭ-brawl'tĕr:* rocky promontory, 3 m. in length, ¾ m. in average breadth, the southern extremity of Spain. It is at the extremity of a low peninsula, which connects it on the n. with Andalusia; its most s. headland, Point Europa, is in lat. 36° 2′ 30″ n., and long. 5° 15′ 12″ w. Five and a half m. across the sea is the Spanish town of Algesiras, between which and Gibraltar, lies the Bay of Gibraltar, called also the Bay of Algeciras On the e. side of this bay is the town of Gibraltar. Pop. about 20,000

The strip of peninsula connecting Gibraltar with the Spanish territory is called the 'neutral ground.' It is so low, that, seen from the sea a few m. off, Gibraltar has the appearance of a detached rock. The approaches both from this neutral ground and from the sea are guarded by a great number of very powerful batteries, and by fortifications so strong in themselves and in their relative bearing on each other, that the rock may fairly be regarded as impregnable so long as a sufficient garrison remains for its defense, with sufficient provision for the maintenance of the troops and any civil inhabitants permitted there during hostilities. The rock is composed of gray primary marble, deposited in strata 20 to 40 ft. thick. The surface near the sea is sandy and red in appearance; higher up, the rock is covered only with short and scanty grass or moss. From the sea its aspect is uninviting, the whole appearing denuded of trees and verdure: nevertheless, there are grassy, wooded glens in the nooks of the mountain. In the crevices of the rock grow asparagus, capers, palmitas, aloes, and cacti, while the fauna disporting on the wild, rarely trodden upper portions, comprises rabbits, partridges, pigeons, woodcocks, and fawn-colored Barbary apes. For various military reasons, shooting is discouraged, and these animals therefore have the utmost impunity. The rock, at its highest point, the Sugar Loaf, attains an elevation of 1,439 ft. above the sea. It is perforated by numerous caverns, the largest of which, called the 'Halls of St. Michael,' has an entrance about 1,000 ft. above the sea. Thence there is a descent through a succession of caves—some ample chambers, others mere passages, through which it is barely possible to creep—to a depth of 500 ft. below the entrance.

There are no springs of fresh water on the rock, and the inhabitants are therefore compelled to depend on the rainfall. In consequence of this, every precaution is adopted to preserve as much of the water as possible; tanks are fed systematically by the drops collected from private roofs,

and conduits are made to guide the drainage from the rock surface into great public reservoirs. Among the latter, the navy tank, for the supply of ships coming to the port, is conspicuous, its capacity being from 9,000 to 11,000 tons of water.

The Bay of Algeciras or Gibraltar, is about 8 m. long by 5 broad, with a depth in the centre of more than 100 fathoms. The anchorage, however, is not very good, and the bay is quite exposed, especially to the s.w. winds, which sometimes drag ships from their anchors and drive them ashore.

Gibraltar has been known in history from a very early period. The Phœnician navigators called it *Alube*, which the Greeks corrupted into *Calpe*, its classical name. With Abyla (now Ceuta) opposite, it formed the Pillars of Hercules, long deemed the western boundary of the world. It is impossible to doubt that such leaders as Hannibal and his fellow-Carthaginians must have been awake to the importance of this rock in their expeditions from Africa into Spain; but we have no certain information of its natural strength being made available for defensive or aggressive purposes until A.D. 711, when the Saracens, passing into Spain under Tarik Ibn-Zeyad, a general of the Caliph Al Walid, for the conquest of the Visigothic kingdom, fortified it, as a base of operations, and a ready point of access from the Barbary coast. From this chieftain it took the name of Gebel-Tarik, or Hill of Tarik, of which Gibraltar is a corruption. One of the old towers of this early castle remains. Subsequently, Gibraltar shared in the revolutions among the Moors of Spain, being now in the hands of Almoravide princes from Africa, and again in the power of native Arab monarchs. In 1309, after a gallant defense, it succumbed to the Christians of Castile under Don Antonio de Guzman. The king of Castile immediately constructed additional works and a dock-yard at the 'Old Mole,' and also took measures to induce a Christian population to settle in the town. The Moors besieged Gibraltar 1315 ineffectually, but 1333 it fell to the army of the king of Fez, whom a siege by the Castilian monarch failed to dislodge. In 1436, the Spaniards tried once more to take the stronghold; but they were unsuccessful, until, in a subsequent siege 1462, the place was captured through the treachery of a renegade Moor. From this time the Moorish power was too thoroughly broken for any serious attempt to be made for the recovery of Gibraltar, which remained in the hands of the Spanish, and was so strengthened by additional fortifications, that the engineers of the 17th c. accounted it impregnable. A combined Dutch and English force, however, under Sir George Rooke and the Prince of Hesse-Darmstadt, demonstrated that Gibraltar, as then fortified, could be taken; for in 1704, after a vigorous bombardment, and a landing in force, the gov. deemed it wise to capitulate.

Since 1704, Gibraltar has remained continuously in the possession of the British, but not without the necessity

of their resisting many desperate efforts on the part of Spain and France to dislodge them. Before the victors had been able to add to the defenses, their mettle was severely tried by a siege 1704–5. In 1720 it was threatened, and 1727 actually attacked by an overwhelming force under the Count de las Torres. During this siege, the place was near falling into the hands of the assailants. The most memorable, however, of the sieges to which Gibraltar has been exposed, commenced 1779, when Britain was engaged in the struggle with its revolted American colonies and at the same time at war with France. Spain took the opportunity of joining the coalition, and directed her whole strength against the isolated garrison of this small but redoubtable fortress.

The communications with Spain were closed 1779, June 21, and a strict blockade established by the Spanish fleet; the strength of the besieged force being at this period 5,382 men, including 1,095 Hanoverians, under Gen. Eliot, the governor. Famine speedily set in; the enemy pushed forward his works for the future bombardment and commenced active annoyance 1780, Jan. 12, by firing several shots into the town. Five days later, Admiral Rodney overcame the Spanish admiral, replenished the supply of provisions in the fortress, added 1,000 men to the garrison, and left it dependent on its own strength. During 1780 little of importance happened; scurvy disabled many of the defenders; the besiegers advanced their works, continually increased their force, and by obtaining possession of the opposite African ports, cut off the last chance of provisions being obtained for the stronghold.

In April 1781, starvation stared the British in the face, when, on the 12th, Admiral Darby convoyed 100 merchant vessels into the bay. The Spaniards instantly opened their fire, hoping to reduce the debilitated garrison before effectual aid was received. 114 pieces of artillery, including 50 13-inch mortars, poured their deadly missiles into the place: for many days this bombardment lasted with unabated vigor; and, though less incessant, it continued until Nov. 26, when, in a desperate midnight sally, the British succeeded in destroying the more advanced of the enemy's lines, in setting fire to many of his batteries, and in blowing up his principal depôt of ammunition. This daring enterprise, successfully carried out against lines mounting 135 guns, was attended with surprisingly small loss, and forms one of the most brilliant incidents in a magnificent defense.

After this repulse, the Spaniards ceased severe hostilities for several days, prior to which cessation the garrison had been incessantly bombarded for nearly eight months, and had had 568 officers and men killed or injured. The siege continued, however, throughout the winter and spring of 1782 without remarkable incident. In July, the Duc de Crillon took command of the assailants, and preparations were made for the grand assault. Additional batteries were constructed on the land-side, and floating batteries

built for this special siege to batter the fortress from the sea. The latter consisted of ten large vessels, whose sides were fortified by seven ft. of timber and other materials supposed to be obstructive of shot; they were covered by slanting shot-proof roofs, and were intended to be moored by massive chains within half-range of the rock. Covered boats, destined to disembark 40,000 troops, were at the same time prepared. The effective force with which Gen. Eliott had to withstand these efforts comprised, with the marine brigade, about 7,000 men.

The great attack commenced Sep. 8, by a simultaneous bombardment from all sides; 9 line-of-battle ships poured in their broadsides; 15 gun and mortar boats approached the town; while from the Spanish lines, 170 pieces of ordnance of large calibre opened in one discharge. This terrific fire continued till the 12th; when the combined French and Spanish fleets, numbering 47 sail of the line, the 10 battering ships mentioned above, esteemed indestructible, with many frigates and smaller vessels, anchored in the Bay of Algesiras. On the 13th every gun of besiegers and besieged was active. The battering vessels proved, as anticipated, invulnerable to shot and shell. At noon the enemy depressed their guns and did much damage; and the defenders then resorted to the expedient of red-hot balls. These, with carcasses, and incendiary shells, were concentrated on the battering ships in unceasing volleys. Success was doubtful for some hours, but toward evening the gigantic efforts of the British force began to show results. The ship of the Spanish admiral was in flames, the second in command was soon in the same condition and though by eight o'clock the attacking squadron was completely silenced, the fire of red-hot shot was continued without intermission till morning. By 4 A.M. on the 14th, eight of the battering ships were on fire. In short, of the ten invincible batteries, every one was finally burned; the Spaniards lost at least 2,000 in killed alone; and the naval attack was completely repulsed with a loss to the heroic garrison of only 16 killed and 68 wounded.

The great bombardment of 1782, Sep. 13, was the crowning triumph of the siege; but the firing continued in a harassing degree from the Spanish lines, until 1783, Feb. 2, when the Duc de Crillon, as much to his own as to Gen. Eliott's satisfaction, announced the conclusion of peace. The thanks of parliament were cordially awarded to the gallant band; and Gen. Eliott received the decoration of the Bath, and subsequently the title of Lord Heathfield.

Since 1783 the British possession has been unmolested. England guards this formidable rock with jealous care; every available point for defense bristles with artillery; the mountain is honey-combed with galleries and bomb-proofs, steep escarps bar all approach, and batteries hewn in the solid stone, frown alike on friend and foe. Immense stores of provision, water, and munitions of war

are constantly maintained; and the whole is garrisoned by a thoroughly efficient force of about 5,000 infantry, with 1,000 artillery, and a smaller body of engineers. The jealousy for its safety would appear to rest rather on making its preservation to the crown of England a point of honor than a matter of national importance; for beyond being a standing menace to Spain, and a source of constant irritation, it is difficult to see its actual use to Great Britain. The harbor is not of great value, and the fortress by no means commands the strait.

In the *town of Gibraltar* the law of England prevails. All religions have perfect toleration; Rom. Catholics are most numerous, having a bishop and a cathedral; next the Jews, who have four synagogues; the Protestants, less numerous also have a bishop. There are three public libraries; the oldest being that started by the famous Col. Drinkwater, historian of the great siege. The town of Gibraltar consists of three parallel streets, in which the curious intermingling of English architecture with the Spanish houses spoils the effect of the whole. English domestic building is eminently unsuited to a climate light and hot, like Gibraltar. There are, nevertheless, some handsome structures.

GIBRAL'TAR, Straits of (anciently *Straits of Hercules*): passage from the Atlantic into the Mediterranean, extending from Cape Spartel to Cape Ceuta on the African coast, and from Cape Trafalgar to Europa Point on the coast of Spain. The Straits narrow toward the e., their width between Europa Point and Cape Ceuta being only 15 m., while at the w. extremity it is 24 m. The length (e. to w.) is abt. 36 m. The tide at Tarifa rises 7 to 8 ft. Through these Straits a continual current runs from the Atlantic, and is so strong that sailing vessels bound westward can pass only by the aid of a brisk wind from the Levant. It is supposed that the waters of the Mediterranean find an outlet here by an undercurrent, as well as by the currents which flow westward along the European and African shores respectively.

GIBSON, *gĭb'sŏn*, Charles Dana, American illustrator: b. Roxbury, Mass., 1867, Sep. 14. He studied at the Art Students League (New York), became known as an illustrator for periodicals, particularly for the comic weekly, *Life*, and through his satirical presentations of wealthy society attained a wide reputation. He has published various collections of his drawings.

GIBSON, John: 1791–1866; b. Conway, N. Wales: sculptor. His father, a landscape-gardener, removed to Liverpool about the beginning of this century, and there Gibson received his education. His love of art showed itself in boyhood; and at the age of 16 he entered the service of a marble-cutter, by whom he was introduced to Roscoe, whose art-treasures were placed at his service. Through the kindness of some wealthy friends

he was enabled in his 26th year, to go to Rome, where he studied under Canova, and Thorwaldsen. Gibson then fixed his residence in Rome, and seldom revisited his native country. His first reappearance in England was after a lapse of 28 years. At first, Gibson showed himself, naturally, a faithful follower of Canova, whose graceful softness he made his own; but he did not stop at that point. By the study of the antique, which Thorwaldsen was the very man to stimulate, Gibson finally rose to ideal purity, and a thorough realization of the grace of form. This advance is clearly traceable in his works. His first important work was a *Nymph unfastening her Sandal.* This was followed by a group, *Psyche borne by the Zephyrs,* for Sir George Beaumont (several times repeated). In the church of St. Nicholas, in Liverpool, is a bas-relief of Gibson's representing a traveller conducted on the dangerous path of life by his guardian angel. Among his greatest works are his *Aurora rising from the Waves to announce the Day* (belonging to Lord Townshend); *The Wounded Amazon* (property of the Marquis of Westminster); *The Hunter and his Dog, Narcissus, Helen, Sappho, Proserpine,* and *Venus.* A spirit of the finest poetry breathes through these works:—they are thoroughly classical, and are marked by a refined and noble severity. His great innovation—tinting his figures, which he defended by a reference to Grecian precedents, has not commended itself to the public taste. Among his portrait-statues, those of Huskisson, Peel, George Stephenson, and Queen Victoria are the best. In 1836 Gibson was elected a member of the Royal Acad., to which he left a representative collection. See *Life* by Lady Eastlake (1869).

GIBSON, Robert Atkinson, Protestant Episcopal bishop: b. Petersburg, Va., 1846, July 9. He entered the ministry in 1870, was rector of Moore Memorial Chapel, Richmond, Va., 1872–8; of Trinity Church, Parkersburg, W. Va., 1878–87; and Christ Church, Cincinnati, 1887–97. In November of the year last named he was consecrated coadjutor-bishop of Virginia, succeeding to the bishopric in 1902.

GIBSON, Robert Williams, American architect: b. Essex, England, 1854, Nov. 17. He studied at the Royal Academy of Arts, came to the United States in 1881 and has since practised his profession in New York. He has designed many important American buildings, among which are the Episcopal Cathedral at Albany, N. Y., and many churches, the Botanical Museum, New York, and banks at Buffalo, Albany, Utica, and elsewhere.

GIBSON, *gĭb'son,* William Hamilton: artist: b. Sandy Hook, Conn., 1850, Oct. 5. He was educated in the Brooklyn Polytechnic Institute, and begun his art career as an illustrator of botanical subjects, drawing a great number of illustrations for the *American Agriculturist, Hearth and Home,* and the *American Cyclopædia.* Subsequently he

furnished drawings on natural history subjects, was engaged on the *Art Journal, Picturesque America, Harper's* and other magazines, illustrated numerous books, and became author and illustrator of several. He was a member of the American Water-color Soc., and exhibited in New York, London, and Edinburgh. He d. 1896, July 16.

GID, n. *gĭd* [a corruption of *giddy*, unsteady, alluding to their tottering gait: Norw. *gidda*, to shake, to tremble]: the disease called 'sturdy' among sheep, caused by parasites on the brain—viz., the *Cœnūrus cerebrālis*.

GIDDINGS, *gĭd'ingz*, Franklin Henry, American sociologist: b. Sherman, Conn. 1855, March 23. He was graduated from Union College in 1877, and engaged in journalism until 1888, when he became lecturer in political science at Bryn Mawr. In 1894 he became professor of sociology at Columbia University. He has written: *The Principles of Sociology; The Theory of Socialization; The Elements of Sociology; Democracy and Empire;* and *Introduction to Sociology*. He has greatly aided in systematizing the facts and theories of his department, and is distinguished from other modern sociologists by the emphasis he lays on the 'consciousness of kind' as the distinguishing motive of the social individual, and one of the chief factors in the organization of society.

GIDDINGS, Joshua Reed: 1795, Oct. 6—1864, May 27; b. Athens, Bradford co., Penn.: statesman. He was brought up on a farm, received a very limited education; entered the army after Hull's surrender of Detroit 1812, and took part in a skirmish with Indians near Sandusky Bay. Returning from the army, he studied hard, taught school, read law with Elisha Whittlesey, and was admitted to the bar of Ashtabula co., Ohio, 1821. In 1826 he was elected member of the Ohio legislature, declined re-election in the following year, and was defeated for state senator 1828. He then applied himself closely to his profession till 1838, when he was elected member of Congress as a whig. In that body he at once became noted for his advocacy of the right of petition and the abolition of slavery and the domestic slave trade, his opposition to the Fla. war, and his participation in the debates on the tariff. In 1841 his name came prominently before the country by his action in the *Creole* case. That vessel had sailed from Norfolk for New Orleans with a cargo of slaves, who rose at sea, seized the vessel, and on making a landing at Nassau, N. P., were set free by British law. Daniel Webster as sec. of state, demanded of the British govt. compensation for the loss of the slaves. Giddings introduced resolutions in the house of representatives declaring that the slaves had committed no crime in taking their freedom on the high seas as they were then beyond the jurisdiction of Va. For this action he was formally censured and cut off from an opportunity to defend himself. He immediately resigned his seat, but was at once and unanimously re-elected. After this he opposed the an-

nexation of Tex., the bill to pay for the *Amistad* negroes, the joint occupation of Or. with Great Britain (claiming that the United States had a right to the whole territory), and the provisions in Indian treaties for the return of fugitive slaves, and urged the Wilmot proviso. 1848 he left the whig and joined the free-soil party, 1849 refused to vote for a whig candidate for speaker of the house, thus giving the office to a democrat, 1850 opposed the compromise measures (q.v.), and the fugitive slave and $10,000,000 Tex. bills. 1855, as senior member of the house, he administered the oath to N. P. Banks, the first republican speaker, and 1859 closed his congressional career. He was appointed U. S. consul-gen. to Canada by President Lincoln 1861, and died at his post in Montreal.

GIDDY, a. *gĭd'dĭ* [AS. *giddian*, to be merry: Gael. *godach*, giddy: Norw. *gidda*, to shake, to tremble]: having a confused sensation of swimming or whirling in the head; rotatory; that causes giddiness; unstable; changeable; thoughtless; elated by excitement. GID'DILY, ad. *-lĭ*. GID'DINESS, n. *-nĕs*, swimming of the head (see VERTIGO); inconstancy; levity. GIDDY-HEADED, very thoughtless.

GIDEON, *gĭd'ĕ-on* [Heb. 'hewer' or 'cutter down,' i.e., 'brave soldier']: greatest of the judges of Israel: lived abt. B.C. 1249; youngest son of Joash the Abi-ezrite. He lived with his father at Ophrah, in Manasseh. The period in which his youth was cast was a gloomy one for Israel: the people had fallen into idolatry, and as a punishment 'the Lord had delivered them into the hand of Midian.' It does not appear that the Midianites exercised their supremacy by any actual form of government. Being chiefly wandering herdsmen, like the Bedouin Arabs of the present day, they were rather in the habit of regularly coming up from the desert 'to destroy the increase of the earth.' So terrible were their marauding expeditions, that it is said they 'left no sustenance for Israel, neither sheep, nor ox, nor ass.' Only in the mountain strongholds, and in dens and caves among the hills, could the people preserve their liberty and the produce of their fields. At last, however, the Israelites began 'to cry unto the Lord,' and a prophet is sent to stir up their religious and patriotic feelings. They, at least portions of them, were obviously ripe for resistance to the enemy. It is at this point that Gideon is introduced by the writer of the Book of Judges, 'threshing wheat by the wine-press to hide it from the Midianites' (vi. 11). Pursuant to a divine message and commission, Gideon with a small but resolute force of Jewish patriots, fell suddenly upon the enemy in the neighborhood of Mount Gilboa, and utterly routed them. The pursuit of the fugitives was continued far across the Jordan toward the Syrian Desert. The effect of the victory was most decisive. The Midianites, we are told, 'lifted up their head no more,' and the land of Israel enjoyed 'quietness forty years in the days of Gideon.' The people wished to make him king, but he religiously refused to tamper with the theocracy.

GIER-EAGLE, n. *jēr-ē′gl* [Ger. *geier-adler*, a vulture-eagle: Dan. *gier;* Ger. *geier*, a vulture]: in *Scrip.*, a bird of the eagle kind; a vulture.

GIERS, *gērs*, NICHOLAS CARLOVITCH DE: Russian statesman: b. 1820, May 9. He was educated at the Imperial Lyceum of Czarskoe Selo, entered the Asiatic dept. of the ministry of foreign affairs 1838, was attached to the Russian consulate in Moldavia 1841, engaged on diplomatic service in Central Asia, Egypt, the Balkan States, and Turkey, was ambassador at Teheran 1863–69, minister at Berne 1869–73, several times acting minister of foreign affairs during Prince Gortschakoff's absence, and was appointed his successor 1882, Apr. He celebrated his golden jubilee of public service 1888, Oct., and received additional honors from his sovereign. He was married to Princess Kantakuzene. He d. 1895, Jan. 26.

GIESELER, *gē′zėh-lėr*, JOHANN KARL LUDWIG: German church historian: 1792, Mar. 3—1854, July 8; b. Petershagen, near Minden, where his father was a clergyman. After attending the orphan-house school and Univ. of Halle, and after teaching for a year, he entered the army, 1813, Oct., as volunteer in the war of liberation. On the re-establishment of peace 1815, he returned to his former situation in Halle, where he taught for two years, and then became *conrector* of the Gymnasium at Minden. In the following year, he was appointed director of a new gymnasium at Cleves, and published an essay on the origin and early history of the gospels, *Historisch-Kritischer Versuch über d. Enttehung u. d. frühern Schicksale d. Schriftlichen Evangelien* (Leipz. 1818). In 1819, he became prof. of theology in the Univ. of Bonn, then recently established; there he began his great work on church history, of which three vols. appeared during his life, and two after his death. This work has been translated into English, and its first 3 vols. have gone through several editions, being greatly valued for the method of picturing the times in happy quotations from contemporary writings. In 1831, Gieseler was called to a chair in Göttingen; became 1837, a consistorial councilor; and later knight of the order of the Guelphs. He was interested in many benevolent schemes, especially in the Göttingen orphan-house. Besides numerous contributions to periodicals and publications on contemporary questions, he edited *Narratio de Bogomilis* of Euthymius Zygabenus (Gött. 1842), and Petrus Siculus' *Historia Manicheorum seu Paulicianorum* (Gött. 1846): he left a vol. on the history of dogmas, published 1856. A notice of his life is prefixed to vol V. of his *Church History*.

GIESSEN, *ghēs′sėn:* principal town of the province of Upper Hesse, in the grand-duchy of Hesse, or Hesse-Darmstadt; in a beautiful and fertile plain at the confluence of the Wieseck and the Lahn, 34 m. n. of Frankfort-on-the Main. It has a well-endowed university (founded 1607), which has commodious buildings for lecturing, well-ap-

pointed anatomical and other museums, a good library, observatory, a famous chemical laboratory (where the illustrious Liebig experimented), botanical garden, etc. There are also various endowed schools, as the Gymnasium Real-Schule, etc., and several institutions for the preliminary instruction of different branches of medical knowledge which are connected with the university. Giessen has manufactories of tobacco, liqueurs, vinegar, soap, and leather, and is an active thriving town. Pop. 30,000.

GIFFORD, *gĭf'ėrd*, ROBERT SWAIN: painter; b. Naushon, Mass., 1840, Dec. 23; d. New York, 1905, Jan. 15. He received a public school education, studied painting with Van Beest of Holland, opened a studio in Boston 1864, and settled in New York 1866. He made long sketching tours in Or. and Cal. for *Picturesque America* 1869, in Algiers and the Great Desert 1874, and Brittany and Southern France 1875. In 1866 be became a founder of the American Soc. of Painters in Water-color, 1867 was elected an associate of the National Acad. of Design, and 1878 an academician. He was also a member of several American and British art societies. He painted many notable works in oil and water-color, exhibited at the Philadelphia centennial exhibition, New York, and Paris, and showed fondness for glimpses of oriental life.

GIFFORD, SANDFORD ROBINSON: 1823, July 10—1880, Aug. 29; b. Greenfield, N. Y.: painter. He was educated at Brown University, studied drawing, perspective, and anatomy in New York with John Rubens Smith, and at the National Acad. of Design; attended a course of anatomical lectures, and began his art career as a portrait-painter, which he soon abandoned for landscapes. In 1851 he was elected an associate of the National Acad., and 1854 an academician, 1855–57 studied in Europe, 1861 spent six months in the army with the 7th N. Y. regt., 1868–9 visited Europe, and then spent about ten years sketching in Colo., Cal., Utah, Or., British Columbia, and the Rocky Mountains, and painting their most striking scenery. He was a member of the Union League and Century clubs of New York, and popular alike as man and artist.

GIFFORD, *gĭf'ėrd*, WILLIAM: 1756–1826, Dec. 31; b. Ashburton, Devonshire: English poet, translator, and critic. At the age of 15 he was apprenticed to a shoemaker, but showing a taste for learning, he was enabled, through the kindness of friends, to enter Exeter College, Oxford. Gifford's first publication appeared 1794, a satirical poem, the *Baviad*, directed against the *Della Cruscans* (q.v.). It crushed them, like the fall of a rock. Flushed with success, Gifford next year produced the *Mœviad*, which satirized offenses in the high places of the drama. In his third satire, Gifford assailed *Peter Pindar* (Dr. Wolcot); and the coarse and witty doctor, the breath of whose nostrils was literary warfare, rushed to the fray with *A Cut at a Cobbler*, and bespattered his opponent with literary mud. Gifford was made editor of

Canning's *Anti-Jacobin*, gained political influence, and was appointed to offices, which jointly yielded £900 per annum. In 1802, he translated *Juvenal*. He edited the works of Massinger, Ford, Shirley, and Ben Jonson, and in his notes assailed former editors with the utmost ferocity. In 1808, he was appointed editor of the *Quarterly Review*, started by Sir Walter Scott and his friends in opposition to the *Edinburgh*. The periodical attained great influence, and he continued his editorial duties till within two years of his death in London.

Gifford had much satirical acerbity and venom, but as a poet he holds no rank. As annotator and editor of the old English dramatists, he did good service, though his work is disfigured by suspicion and malignity. As a critic he was bitterly partial and one-sided, and his praise and blame depended on the political leanings of the writer. Leigh Hunt was to be pursued like a wild-beast, because he was a Liberal; and the flower-garden of *Endymion*, every rose of which was fed by the dews of paradise, was to be trampled upon with critical hoof, because Keats was known to have written a sonnet in praise of Hunt, and was understood to be his private friend. Gifford had been rudely nurtured; he lived in a time of great political uncharitableness; and if a portion of the bitterness he displayed may be set down to natural disposition and turn of mind, the larger part, perhaps, must be explained by the pressure of his times.

GIFT, n. *gĭft* [Icel. and Dut. *gift*, a gift, a present—from GIVE, which see]: a present; anything given or bestowed; an offering; power of giving; faculty: V. to endow with any power or faculty. GIFT'ING, imp. GIFT'ED, pp.: ADJ. endowed by nature with any power or faculty; talented; endowed with gifts. GIFT'EDNESS, n.—SYN. of 'gift': donation; grant; benefaction; largess; gratuity; boon; bounty; endowment; talent; offering; bribe; oblation; power.

GIFT, in Law: gratuitous transfer of property. Any person is at liberty to do what he pleases (not to the injury of the public) with his own property, and to give it away with or without consideration. When he gives away goods or chattels, mere delivery of possession, accompanied by words of gift, is sufficient to transfer the property; and then the transaction is irrevocable. But if he does not give possession of the goods at the same time, then, in order to be binding upon him, he must execute a deed or writing under seal. The reason of this is, that a mere verbal promise, without some legal consideration, is nugatory and revocable; whereas, one who executes a deed, is stopped from ever afterward denying it. Where the property given is not personal, but real, then a deed is in general absolutely necessary to transfer the property. A will is the most familiar example of a gift of property both real and personal, for the testator generally, in such a case, gives away his property gratuitously. Each gift of personalty by will is

known usually as a legacy; and a gift of land is known usually as a devise.

As sometimes the power of giving away property gratuitously is abused, to defraud and defeat creditors, statutes commonly provide that a voluntary conveyance, whether of chattels or and, made by a person at the time insolvent, shall be void as against such creditors; and they are entitled accordingly to recover the property from the donee. The gift, however, even in such a case, stands good against the donor himself. So, if any person give by deed gratuitously any land, and then sell the same land, the gift will be void against the *bonâ-fide* purchaser.

There is a peculiar kind of gift, or rather a gift made in peculiar circumstances, called a *Donatio Mortis Causa*, i.e., a gift by a person on death-bed of some personal property, such as chattels, money bills of exchange, etc. Such gifts are usually held good, if they comply with certain conditions. This is in substance a mode of giving personal chattels to a particular individual, without the necessity or intervention of a will; but such gifts are so often afterward disputed, that it is better to include them in a will.—In Scotland, a gift may be made of goods in the same manner as in England; but it is usually called a *Donation* (q.v.): Gift, in the Law of Scotland, often denotes a grant or appointment by the crown or a court.

GIG, n. *gĭg* [F. *gigue*, a jig or rapid dance; *giguer*, to run, to leap: It. *giga*, a jig, an air for dancing; Icel. *geiga*, to rove at random]: a light two-wheeled carriage; a long light boat; anything light, swift, or whirling; a machine for forming the nap of cloth: see JIG.

GIGANTIC, a. *jī-găn′tĭk* [L. *gĭgan′tem*, a giant (see GIANT)]: very large; huge; of extraordinary size; enormous. GIGAN′TICALLY, ad. *-tĭ-kăl-lĭ*. GI′GANTOL′OGY, n. *-tŏl′ŏ-jĭ* [Gr. *logos*, a discourse]: an account or description of giants. GIGANTEAN, a. *jī′găn-tē′ăn*, belonging to a giant; gigantic.

GIGGLE, n. *gĭg′gl* [an imitative word: Dut. *gickelen:* Swiss, *gigelen*, to giggle: comp. Icel. *gagl*, a goose; Gael. *gigail*, tickling—from *gig*, to tickle]: a short tittering laugh: V. to laugh in a silly manner; to titter. GIG′GLING, imp. *-glĭng:* ADJ. laughing in a suppressed way; tittering: N. half-suppressed or simpering laughter; the act of tittering. GIG′GLER, n. *-glėr*, one who.

GIGOT, n. *jĭg′ŏt* [F. *gigot*, a leg of mutton—from *gigue* the thigh]: a joint; a leg of mutton.

GIJON, *hē-hōn′:* fortified town and seaport of Spain, province of Oviedo (former Asturias), 20 m. n.n.e. of the town of Oviedo; on a low peninsula projecting n. into the Bay of Biscay. It is the best and most regularly built town in the province; partly surrounded by old walls, and defended by an old castle and by coast batteries. It has a good port, at which steamers call regularly. There are manufactures of stone-wares, hats, and linen fabrics; nuts and other fruits are exported. Bermudez, historian of Spanish art, was born here. Pop. 35,000.

GILA, *chē'lȧ*, Rio: river of N America, rising in the territory of New Mexico, lat. 32° 45′ n., long. 108° 30′ w.; flowing nearly 450 m. w. till it joins the Colorado, about 70 m. above the fall of that river into the Gulf of California. For a part of its course it is wholly inaccessible, being imprisoned within wall of perpendicular rock nearly 1,000 ft. high. It is navigable for flat-boats abt. 180 m. Numerous ruins of stone houses, with fragments of pottery, indicate that the region of the Gila was formerly populous.

GILA MONSTER, the poisonous lizard (*Heloderma suspectum*) of the sandy deserts of the southwestern United States, so called because first brought to notice in the valley of the Gila River, Arizona, and on account of the great size (two feet in length) which it sometimes attains. Another 'species' (probably a variety—*H. horridum*) exists in the arid parts of Mexico, where it is called 'caltotepon' or crust-lizard. These constitute a family *Helodermatidæ*, characterized by the presence of pleurodont, fanglike teeth, each with a groove on its front and rear surface, and each having near its base a labial gland which secretes venom of the same nature as that of serpents. The food of these lizards consists of worms, centipedes, the eggs of birds and lizards, frogs and other small animals which its bite paralyzes or kills.

GILBERT, *gĭl'bėrt*, Sir Humphrey: 1539–1583, Sep. 9; b. Dartmouth, Devonshire: English navigator. He studied at Eton and Oxford; abandoned law for arms, and by good service against the Irish rebels earned knighthood and the government of Munster (1570), after which he saw five years' campaigning in the Netherlands. In 1576 appeared his Discourse on a N. W. Passage to India, and two years later he obtained a royal patent 'to discover and occupy remote heathen lands not actually possessed of any Christian prince or people.' With his younger half-brother, Sir Walter Raleigh, he sailed in quest of the 'Unknown Goal;' but this expedition (1578–9) which had cost all his own and his wife's estates, was frustrated by internal dissensions, tempests, and a fight with the Spaniards. Nothing daunted, he once more set sail from Plymouth, 1583, June, and in Aug. landed in Newfoundland, of which he took formal possession for Queen Elizabeth. Sailing southward, he lost, off Cape Breton, the largest of the three vessels left out of five, so was forced to steer homeward with the *Golden Hind* and the *Squirrel*, the latter a 'frigate' of only 10 tons burden. 'On Monday the 9th September,' writes the *Golden Hind's* captain, ' the *Squirrel* was near cast away, yet at that time recovered; and giving forth signs of joy, the general, sitting abaft with a book in his hand, cried out unto us in the *Hind*, "We are as near to heaven by sea as by land." The same Monday night the frigate's lights went suddenly out, and it was devoured and swallowed up by the sea.'

GIL'BERT, Sir John: English painter: b. Blackheath, near London, 1817, July 21; d. Villers-sur-Mer, France,

1897, Oct. 5. After his school-days he was placed at a mercantile house in the city, but after two weary years was pronounced wholly unfit for business, and allowed to follow his true vocation—art. Except for some lessons from Lance, fruit-painter, he taught himself; his masters, the Old Masters—Rubens, Rembrandt, Velasquez. In 1836 he began to exhibit in oil and in water-colors, and 1852 was elected an associate, 1853 a member, 1871 the president of the Soc. of Painters in Water Colors, receiving soon afterward the honor of knighthood. He became an A.R.A. 1872, R.A. 1876, and a chevalier of the Legion of Honor. Gilbert has well been called the 'Scott of Painting.' His favorite subjects were historical, chivalric, antiquarian; and his bold, though somewhat monotonous, style is familiar less by the numerous works that he exhibited than through his countless wood-engravings in the *Illustrated London News*, and editions of Shakespeare, Scott's poems, *Don Quixote*, etc.

GILBERT, JOHN GIBBS: 1810, Feb. 27—1889, June, 17; b. Boston: actor. Receiving a public school education, he made his first professional appearance on the stage at the Tremont Theatre, Boston, 1828, Nov. 28, as Jaffier in *Venice Preserved*. He filled engagements in New Orleans, Boston, and New York; went to London 1847 and Paris 1848, reappeared in New York, Philadelphia 1851, Boston 1857, and 1862 joined the stock company of Wallack's Theatre, New York, with which he remained till its disbanding, 1888.

GIL'BERT (or GILBERD), WILLIAM: the most distinguished man of science in England during the reign of Elizabeth: a physician: 1540–1603, Nov. 30; b. Colchester, of which town his father was recorder. A member, and subsequently fellow of St. John's College, Cambridge, he took his B.A. 1560, M.A. 1564, and M.D. 1569. In 1573 he settled in London, and practiced with such reputation that he was appointed physician to Queen Elizabeth. His spare time was given to philosophical experiments, particularly in relation to the magnet; and in these he was assisted by a pension from the queen. He was elected president of the College of Physicians 1600. On Elizabeth's death, he was continued as court physician by James I., but survived his royal mistress only a few months. His death seems to have taken place in London; but he was buried at Colchester, in the church of the Holy Trinity. He was never married. His works are *De Magnete Magneticisque Corporibus, et de Magno Magnete, Tellure, Physiologia Nova* (1600), and *De Mundo nostro Sublunari Philosophia Nova* (1651). The first has served as the basis of most subsequent investigations on terrestrial magnetism; and (to use Whewell's words, *History of the Inductive Sciences*) it 'contains all the fundamental facts of the science, so fully examined, indeed, that even at this day we have little to add to them.' He establishes the magnetic nature of the earth, which he regards as one great magnet; and he conjectured that terrestrial magnetism and

electricity were two allied emanations of a single force—a view which was demonstrated with scientific strictness more than two centuries afterward by Oersted and Faraday. Gilbert was the first to use the terms 'electric force' and 'electric attraction,' and to point out that amber is not the only substance which when rubbed attracts light objects, but that the same faculty belongs to the resins, sealing-wax, sulphur, glass, etc.; and he describes how to measure the excited electricity by means of an iron needle moving freely on a point. Galileo pronounced him 'great to a degree that might be envied;' and the publication of his treatise *De Magnete* will always be regarded as epoch-making in the history of magnetism and the allied sciences.

GIL'BERT, William Schwenck: dramatist: b. London, England, 1836, Nov. 18. He was educated in the Univ. of London and called to the bar 1864, but afterward applied himself to literature and dramatic writing. His plays include *Dulcamara* (1866); *The Palace of Truth* (1870); *Pygmalion and Galatea* (1871); *The Wicked World* (1873); *Broken Hearts* (1876); farces, *Engaged* (1877); *Ne'er-do-Weel* (1878); and comic operas in conjunction with Sir Arthur Sullivan, *H. M. S. Pinafore, The Pirates of Penzance, Patience,* and *Iolanthe,* etc.

GILBERT DE LA PORRÉE, *zhĕl-bär' dĕh lȧ po-rā',* (Gilbertus Porretanus or Pictaviensis): bishop of Poitiers, logician, and theologian: b. Poitiers, France; d. 1154. He was educated at Chartres and served some time as teacher in the church there. Soon after 1135 he removed to Paris, and while delivering public lectures on dialectics and theology was recalled to Poitiers and elected bp. 1141. His works were condemned for their heterodox view of the Trinity, and 1148 his writings were condemned by the Synod of Rheims till he should correct them in accordance with four propositions made by the synod and sanctioned by the pope. To this judgment he assented, and experienced no further ecclesiastical opposition during his life. His chief logical work, *De Sex Principiis,* is a discussion of the Aristotelian categories, particularly of the six subordinate modes. In his commentary on the treatise *De Trinitate* he argued from the basis that pure or abstract being is prior in nature to that which is, and his distinction between Deitas or Divinitas and Deus led to the condemnation of his doctrine.

GILBERTINES, *gĭl'bĕr-tĭnz:* a religious order in the Roman Catholic Church, specially noteworthy as being of English origin. It was founded in the twelfth c. by St. Gilbert, a native of Sempringham, in Lincolnshire. The rule of the order was mainly derived from that of the Canons Regular of St. Augustine. St. Gilbert also founded an order of nuns after the Benedictine institute. Both orders were approved, and had numerous convents in England at the time of the Reformation, when they shared in the general suppression.

GIL'BERT ISLANDS: group on the s.w. coast of the

archipelago of Tierra del Fuego, offering a good harbor in Doris Cove.

GILBERT ISLANDS: cluster comprising 15 coral islands, part of the Mulgrave archipelago in the Pacific, lat. 1° s.—2° 30′ n., and long. 172°—174° 30′ e. The two largest are known as Drummond's Isle and Knox's Isle; the former 30 m. long by a little more than ½ mile broad, the latter 20 m. long. The inhabitants resemble the Malays in appearance, and are divided into three classes—chiefs, landholders, and slaves. See POLYNESIA. The chief, almost the only, cultivated products are the cocoa-nut and the pandanus. Pop. 35,200.

GIL BLAS, *zhēl blâ*, Sp. *ċhēl blâs:* hero of Le Sage's famous novel: see LE SAGE, ALAIN RENÉ.

GILBOA, *gĭl-bō′a* [Heb. 'bubbling fountain']: range of hills, between 500 and 600 ft. high, overhanging the city of Jezreel, in the e. side of the plains of Esdraelon; memorable as the scene of the defeat and death of King Saul and his three sons.

GILD, v. *gĭld* [AS. *gilden*, golden, gilt: Icel. *gylla*, to gild (see GOLD)]: to overspread with a thin covering of gold; to overlay with gold leaf-metal or powder; to render bright; to adorn; to give a fair appearance to falsehood and the like. GILD′ING, imp.: N. the art or trade of overlaying with gold-leaf, etc.; that which is laid on; *figuratively*, superficial coating, as opposed to the solid metal. GILD′ED, or GILT, pp. or pt. *gĭlt*. GILDER, n. *gĭld′ėr*, one whose trade is to gild.

GILDAS, or GILDUS, *gĭl′dŭs* (by some surnamed the Wise, by others Badonicus), abt. 516–570: earliest British historian. He visited France 550, and Ireland 565. His *De Excidio Britanniæ Liber Querulus* was printed first at London 1525, and has often been reprinted in England and on the continent. The best editions are Stevenson's, published by the English Historical Soc. (Lond. 1838), and Petrie's in *Monumenta Historica Britannica* (Lond. 1848). His narrative may be divided into two periods—the first, from the invasion of Britain by the Romans to the revolt of Maximus, at the close of the 4th c.; the second, from the revolt of Maximus to the author's own time.

GILDER, *gĭl′dėr*, JEANNETTE LEONARD, American editor: b. Flushing, N. Y., 1849, Oct. 3. Having entered journalism in 1869, she became editorially connected with *Scribner's Monthly* (the present *Century Magazine*), was a member of the New York *Herald* staff as literary editor and later musical and dramatic editor (1875–80), and in 1881 with her brother, J. B. Gilder (q.v.), founded and became editor of the *Critic*, a monthly review, afterwards *Putnam's Mag.* Her publications are: *Taken by Siege* (1886–96); *The Autobiography of A Tomboy* (1900); *A Tomboy at Work* (1904); etc. She also dramatized Sienkiewicz's *Quo Vadis* and has edited *Essays from the Critic* (1882), and *Authors at Home* (1889), with J. B. Gilder;

Representative Poems of Living Poets (1886); with Helen G. Cone, *Pen Portraits of Literary Women* (1887); etc.

GILDER, Joseph B., American journalist: b. Flushing, N. Y., 1858, June 29. After varied experience in journalism, he, with his sister, J. L. Gilder (q.v.), established the *Critic*, of which he became editor. In 1895 he was appointed literary adviser to the Century Company and subsequently London representative of Dodd, Mead & Company. He was editor of *Putnam's Magazine* (formerly *The Critic*) from 1906-10.

GILDER, Richard Watson, ll.d.: poet and editor: b. Bordentown, N. J., 1844, Feb. 8. He was educated in a private school, served through the emergency campaign during the Confederate invasion of Penn. 1863, became a reporter in Newark, N. J., 1865, and assisted in starting a morning newspaper there 1868, was appointed editor of *Hours at Home*, New York, 1869, assistant editor of *Scribner's Monthly* (now the *Century*), and editor-in-chief on the death of Dr. J. G. Holland 1881. He was prominently identified with public affairs as chairman of the New York Tenement-house Commission (1894), member of the council of the National Civil Service Reform League, and other posts, and was a founder of the Authors' Club, the International Copyright League and the Society of American Artists. He received the degree l.l.d. from Dickinson College 1883 and from Wesleyan 1903, a.m. from Harvard 1890, and l.h.d. from Princeton 1896 and Yale 1901, and has published *The Poet and His Master* (1878); *The New Day* (1875); *Lyrics* (1885); *The Celestial Passion* (1887); *Two Worlds*; *The Great Remembrance* (the last five published in *Five Books of Song*, 1894); *In Palestine* (1898); *Poems and Inscriptions* (1901); *A Christmas Wreath*, collection (1903). D. 1909, Nov. 18.

GILDER, William Henry, American journalist and arctic explorer: b. Philadelphia 1838, Aug. 16; d. 1900. He served in the Civil War, and was brevetted a major at its close. He accompanied Lieut. Schwatka in 1878 on a polar expedition, and in 1881 was a member of the Rodgers expedition as a correspondent of the New York *Herald*. His chief works are: *Schwatka's Search* (1881); *Ice Pack and Tundra* (1883). He was a brother of R. W. Gilder (q.v.).

GILDERSLEEVE, Basil Lanneau: an American classical scholar; b. in Charleston, S. C., 1831, Oct. 23; was graduated at Princeton University in 1849, and then studied in Germany at the universities of Berlin, Bonn, and Göttingen. He was prof. of Greek and Latin at the University of Virginia in 1856–76. In the latter year he was made prof. of Greek at Johns Hopkins University. He is the editor of the *American Journal of Philology*, of which he was the founder. He wrote *Satires of Persius Flaccus; Justin Martyr; Odes of Pindar*. He also published a Latin grammar and a volume of *Essays and Studies*.

GILDING.

GILDING: coating with gold. There are many processes, varying with the substance to be gilded, and the effect to be produced; but all may be classified under three heads—1st, mechanical gilding; 2d, chemical gilding; 3d, encaustic gilding.

The first is used chiefly for gilding wood, plaster of Paris, leather, paper, and other substances. If the object to be gilt is a picture or mirror-frame, consisting of a plain wooden molding, then, after a coat of oil-paint, 4 to 10 coats of fine whiting mixed with fine glue are put on, each in turn smoothed with pumice-stone and fine sand paper. This done, a coat of gold-size is given to those parts which are not to be burnished; but those to be burnished receive only a coating of clear animal size. Both of these prepared surfaces now receive the gold-leaf, laid on by means of a broad thin brush called a *tip*, and further pressed on with a thick soft-haired brush. Those parts which have been gold-sized are in this way oil-gilt, and will stand washing; while such portions as have been gilt on the size preparation in order to be burnished, will not bear soap and water. If the picture-frame is much enriched with raised ornament, then the various coatings of whiting are not smoothed with pumice or sand-paper. In many cases, especially with outside work, the surface to be gilt is previously prepared with oil-paint and gold-size alone. The *gold-size* used for oil-gilding is of different kinds: sometimes it consists of boiled linseed-oil and ground ochre alone; another kind has copal varnish and turpentine in addition. Japanners' gold-size is a mixture of ½ lb. of linseed-oil, 2 oz. of gum-animi in powder, and some vermilion.

Japanner's gilding.—Where gilt ornaments are to be put on a japanned ground, they are, by one method, painted with gold-size, and gold-leaf is afterward applied. By another way, a little more than the space that the ornament is to occupy is wholly covered with gold-leaf, adhering with isinglass. The ornament is then painted on with asphaltum, which protects the gold beneath it while the superfluous leaf is being washed away. A little turpentine will then remove the protecting asphaltum so as to display the gilt ornament.

False gilding, though an old invention, has become in recent years an important trade in Germany. It is applied usually to moldings for pictures, mirrors, and room decoration. The molding intended to be 'gilt' in this way is first covered with silver-leaf or tin-foil on a surface prepared as above, and then coated with a yellow varnish. A cheap and very durable imitation of genuine gilding is thus obtained, with which most of the less costly picture-frame moldings are now covered.

Chemical gilding.—Metals are now gilded usually by the process of electro-gilding (see GALVANISM): but besides this, various methods of chemical gilding are still in use.

Water or wash gilding, as it is somewhat inappropriately termed, consists in applying to metal a paste formed of an amalgam of gold, and afterward evaporating the volatile mercury by heat, which leaves the gold firmly adhering

to the surface of the metal. In preparing the amalgam, about 8 parts of mercury to 1 of gold are used, but when this is squeezed through chamois leather, some mereury is removed, so that the amalgam actually applied eontains about 33 per cent. of gold. The metal to be gilt is eleaned with aeid, brushed, and rubbed with bran or sawdust to make its surfaee perfectly clean. By means of a wire brush a solution of nitrate of mercury is then applied to it with a portion of the gold amalgam. The mereury is driven off by heating at a chareoal fire, and then the gilt surfaee is then ready for *burnishing*, which is done by rubbing with a hæmatite burnisher. The *deadening* is produeed by coating the surfaee with a mixture of sea salt, nitre, and alum, and applying heat. Although modern appliances have diminished the evil, water-gilding is still injurious to those who work at it from the effeet of the mercury fumes. This old method is really better and more durable than eleetro-gilding though the eontrary is often believed. It is asserted that the introduction of the latter method has caused the decline of the once prosperous gilt-button trade; at all events, the more eostly kinds of decorative work in metal are now gilt as of old by the mercury proeess. 30,000 buttons, one inch in diameter, may be gilded with one ounce of gold; 14 or 15 thousand is the number over whieh this quantity is commonly spread.

Gilding by immersion.—For this purpose a solution is used which slowly attacks the metal to be gilded, and at the same time deposits on its surfaee an equivalent of gold. Elkington's patent solution is made by dissolving $\frac{1}{4}$ ounce troy of fine gold in $2\frac{1}{2}$ ounces of nitro-muriatic acid, heating this until red and yellow vapors cease to be evolved, then diluting with $1\frac{1}{2}$ pint of distilled water, adding to this 1 pound of biearbonate of potash, and boiling for two hours: the article to be gilded is dipped into this at nearly the boiling heat, and agitated in it for about a minute. Talbot's patent solution is made by adding a solution of gold to a solution of gallic aeid in water, alcohol, or ether: the articles are dipped as above.

Grecian-gilding is a process intermediate between G. by immersion and water-gilding. Sal ammoniac and corrosive sublimate are dissolved in nitric acid, and gold is dissolved in this solution, which thus becomes a mixture of chloride of gold and nitrate of mercury with some ammonia. This solution, applied to a surface of silver, immediately blackens it, but on the application of heat, it richly gilded.

Most articles gilded by either of the above chemieal methods, or by electro-gilding, are submitted to an afterprocess of *coloring*. This consists either in acting on the surface with a saline solution, and heating the article afterward or in coating it with a kind of varnish of bee's-wax and yellow-ochre, and then burning it off. Various saline solutions are used, many of which are carefully guarded trade secrets. 1 oz. alum, 1 oz. of common salt, and 2 oz. nitre dissolved in half a pint of water, is recommended: also 24 parts of nitre, 10 alum, 5 sulphate of iron.

5 sulphate of zinc boiled together in sufficient water to form a paste when cooled, with continual agitation. The articles are immersed in this, and then heated till the desired color is obtained.

Cold-gilding.—For this a gilding powder is first prepared by dissolving 5 drams of pure gold and 1 dram of copper in 10 oz. of nitro-muriatic acid, then moistening clean linen rags with the solution, and burning them to ashes. These ashes contain finely divided gold, which may be applied to surfaces of copper, brass, or silver, by simply rubbing it over them with a piece of cork moistened with a solution of common salt in water.

Sword-blades, lancets, and other steel articles are gilded in fancy devices by drawing the design with a camel's-hair pencil moistened in a solution of gold, prepared by agitating ether with a solution of terchloride of gold, and decanting the light liquid which floats on the top. Steel or iron can be gilded in a more durable manner by heating it and then applying gold-leaf,

Silks, artificial flowers, ivory, bone, etc., may easily be gilded by immersing them in, or painting them with, a neutral solution of 1 part of terchloride of gold to 4 or 5 of water, and then exposing them in a vessel containing hydrogen gas, which readily combines with the chlorine, and reduces the gold to the metallic state.

Encaustic-gilding is applied usually to glass and porcelain. The gold is first obtained in a finely divided state by precipitating from the chloride with protosulphate of iron, or by simply heating the chloride. This powder is ground up with $\frac{1}{12}$ of its weight of oxide of bismuth and some borax and gum-water, and then painted on the ware. It is then heated till the borax is vitrified and the gold thereby fixed. Sometimes the gold is ground with turpentine, or an amalgam of gold is used. It has a brown dingy appearance when it leaves the kiln; the gold lustre is brought up by burnishing.

GIL'DING MET'AL: metal of which goods are made to be coated in imitation of gold. It is required to have as nearly as possible the color of gold, so that when the surface-gilding is worn off at the more exposed parts, the difference of color will not be readily apparent. This is obtained by making a kind of brass having a much larger proportion of copper than common brass. The following are three receipts from among a variety in use: 1st, 6 parts copper, 1 common brass; 2d, 4 parts copper, 1 Bristol-brass; 3d, 13 parts copper, 3 parts brass, 12 parts tin: this is much harder than the first two. See also GILT JEWELRY.

GIL'EAD [Heb. hard or rugged]: hilly, rocky district on the e. side of the Jordan, bounded n. by the river Hieromax (modern *Sheriat-al-Mandhûr*), which separated it from the rich levels of Bashan; e. by the desert table lands of Arabia; s. by Moab and Ammon; w. by the Jordan. In spite of its name, the vegetation is luxuriant, especially in the middle, and round the brook Jabbok, where forests of oak and terebinth occur. The hills are

not very high; they have broad summits almost like table-lands, 'tossed,' says Dean Stanley (*Sinai and Palestine*), 'into wild confusion of undulating downs.' G. anciently produced gums and spices. It was given by Joshua to the tribes of Gad and Reuben, because of the multitude of their cattle, and as a frontier land was much exposed to invasion. See Oliphant's *Land of Gilead* (1880).

GILES, *jīlz*, SAINT (ÆGIDIUS, EGIDIO, GIL, or GILLES): pious and charitable Athenian of royal descent, who distributed his patrimony among the poor, spent two years with St. Cæsarius at Arles, and lived in the solitude of a desert till discovered by the king on a hunting expedition. A monastery was built on the site of the cave that he had inhabited, and he was its abbot till his death. He was credited with being the involuntary medium of many miracles, the best known being the cure of a sick man to whom he had given his tunic. Some authorities distinguish the saint from the first abbot of the same name, and assign the date of the former to the close of the 7th c. In the 11th and following c. the saint came to be regarded as the special patron of lepers, beggars, and cripples, and in England alone there are 146 churches dedicated to him. His day is Sep. 1.

GILET, n. *jĭl'ā* [F. *gilet*, a flannel waistcoat]: a style in which a bodice is made; a waistcoat; a coat-bodice.

GILFILLAN, *gĭl-fĭl'an*, GEORGE, 1813–1878, Aug. 13; b. Comrie, Scotland: critic and essayist. He studied at the Univ. of Glasgow, and at the divinity hall of the secession body, afterward the United Presbyterian Church, and 1835 he was licensed to preach. In 1836, March, he was ordained over the School Wynd Church, Dundee. His works are numerous. They display a rich but reckless fancy, and wide literary sympathies, though deficient in refinement of taste. Among them are, *A Gallery of Literary Portraits* (1845); a second *Gallery* (1849); *The Bards of the Bible* (1850); *The Martyrs, Heroes, and Bards of the Scottish Covenant* (1852); a third *Gallery of Literary Portraits* (1854); *History of a Man* (1856); *Alpha and Omega* (1860); *Night:* a poem (1867); *Life of Sir W. Scott* (1870); and *Life of Dr. W. Anderson* (1873). In 1853 he commenced an edition of the *British Poets* in 48 vols. His contributions to periodicals have been numerous.

GILGAL, *gĭl'găl:* three ancient towns mentioned in the Bible.

The first and most important was w. of the Jordan, near Jericho, in Benjamin, where Jacob spent the first night after crossing the Jordan. Josephus located it 50 stadia from Jordan and 10 from Jericho; Jerome placed it 2 Roman m. from Jericho and spoke of it as a deserted place venerated by the people near; and Schokke, a German traveller, who recently discovered its site, and the English survey party, fixed it 2 m. e. of the site of Byzantine Jericho, and 1 m. from the modern Erîha. It is now called Jiljûlieh, and exhibits remains of a tamarisk, church, and large reservoir. (See Deut. xi. 30; Josh. iv. 19, etc.).

The second Gilgal was on the maritime plain between Dor and Tirsa. Jerome mentioned a town of the name, 6 Roman m. n. of Antipatris, supposed to be the modern Kalkilia; but other authorities incline to the belief that a large village 3 m. n. of Antipatris is the site of the biblical town. (See Josh. ix. 6, etc.).

The third Gilgal was in the mountain district near Bethel, 12 m. s. of Ebol and Gerizim, 7 English m. n. of Beitin. It also was mentioned by Jerome, and its site is now supposed to be occupied by Jiljilia. (See II. K. ii. 1, etc.).

GILGIT, *gĭl-gĭt:* name applied to a river tributary to the Upper Indus, also to the whole of its basin, and to a secluded valley state. The remote source of Gilgit river is Shundar Lake, above Mastúj. After a course of 60 m. it is joined by the Yassin river, flowing from the n. and comprising two streams that unite 6 or 8 m. above Yassin village. About 21 m. below the confluence of the Ghizar and Yassin rivers, another important stream, the Karambar, joins Gilgit river, also flowing from the n.; and 40 m. below the Ghizar-Yassin confluence the Gilgit river receives its last important confluent, the Nagar. The length of Gilgit basin, as far as explored, on a line nearly w. to e. is 120 m., and its greatest width from n. to s. about 75 m. The n. limit of the basin is formed by the Muztagh mountains with peaks 23,330–25,050 ft. high; the s. limit by a watershed with peaks 18,490–19,440 ft. high; the e. limit by an offshoot of the Muztagh with peaks and glaciers 19,000–25,550 ft. high; and the w. limit the lofty watershed which divides the basin from the Mastúj valley. The states occupying the basin are Yassin, the upper or w. part, with chief town of the same name at height of 7,770 ft.; Punial or Punya, a tract of 25 m. in the narrow valley of the river, with 9 villages 5,500–7,000 ft. high; Nagar, on left bank of the river; and Gilgit, comprising all the lower part of the main valley to the Indus, a stretch of 35 m. The village of Gilgit is 4,800 ft. above the sea, on a flat plain of the river alluvium, forming a terrace 30 or 40 ft. above the water. The houses are flat-roofed and built in clusters of twos and threes among groups of fruit trees. The fort of Gilgit is the chief stronghold of the Maharaja of Kashmir in Dardestan.

GILL, n. *jĭl* [OF. *gelle,* a sort of wine measure: OE. *gylle,* a little pot: mid. L. *gillo,* a wine measure]: a liquid measure containing the fourth part of a pint or the 32d part of a gallon; a liquid measure varying in quantity locally.

GILL, n. *jĭl* [a shortened name for *Gillian*—from L. *Julĭāna*—from L. *Jūlĭŭs,* Julius]: in *OE.*, formerly a generic name for a woman; ground-ivy—called *gill-creep-by-the-wall.* GILL-ALE, the herb ale-hoof. GILL-FLIRT, a wanton girl.

GILL, n *gĭl* or *jĭl* [Icel. *gil,* a deep narrow glen with a

stream; *geil*, a ravine]: in *prov. Eng.*, a woody glen with a rivulet flowing through it; a deep ravine.

GILL, *gĭl*, Sir David, Scottish astronomer: b. Aberdeen, 1843, June 12. He was chief of staff of Lord Lindsay's observatory, founded in 1870; in charge of Lindsay's expedition to Mauritius in 1874 to observe the transit of Venus and the opposition of Juno, by means of the heliometer, for the determination of the solar parallax. He determined the longitudes of Malta, Alexandria, Suez, Aden, Bombay, Seychelles, Reunion, Mauritius, and Rodriguez by cable and chronometers, and measured the first base-line for the Egyptian triangulation at the request of the khedive. In 1877 he was in charge of the expedition to Ascension to observe the opposition of Mars for parallax; and in 1879 appointed director of the Cape Observatory. He has published many valuable professional papers and reports.

GILL, John, d.d: 1697. Nov. 23—1771, Oct. 14; b. Kettering, Northamptonshire, Eng.: Bapt. minister of some eminence as a theologian. He studied mainly in private, and by his unaided efforts attained proficiency in Latin, Greek, and Hebrew. He afterward applied himself to the study of the rabbinical writers, and is notable as one of the first English divines who brought rabbinical learning to bear on the interpretation of the scriptures. He became, 1719, pastor of a Bapt. church in Southwark; from which, 1757, he removed to a chapel near London Bridge, and there ministered till his death. His first important work was an *Exposition of the Song of Solomon* (fol. 1728), in which he vindicated the authenticity of that book against Whiston. His *Exposition of the New Testament* appeared 1746–48; and his *Exposition of the Old Testament* subsequently (republished as one work, 9 vols., 1810); *A Body of Doctrinal Divinity* (1769); and *A Body of Practical Divinity* (1770).

GILL, Theodore Nicholas: an American educator; b. 1837, Mar. 21; was educated by special tutors; early turned his attention to natural history; became prof. of zoology at Columbian University 1884. Among his works are: *Arrangement of the Families of Mollusks; Arrangement of the Families of Mammals; Catalogue of the Fishes of the East Coast of North America;* and *Scientific and Popular Views of Nature Contrasted.*

GILLEM, *gĭl'lĕm:* Alvan G.: 1830–1875, Dec. 2; b. Tenn.: soldier. He graduated at the U. S. Milit. Acad., 1851; entered the army as brev. 2d lieut. of artill.; was promoted 2d lieut. 1851, 1st. lieut. 1855, capt. and assist. quarter-master 1861, and col. 24th U. S. inf. 1866; appointed col. 10th Tenn. vols. 1862, provost-marshal of Nashville 1862, Aug.–Dec.; promoted brig.gen. vols. 1863; brevetted col. U. S. A. 1864, and maj.gen. vols. 1865, was vice-pres. of the Tenn. constitutional convention 1865, Jan., and as col. of the 1st U. S. cavalry pursued the

Modoc Indians and was conspicuous in the battle of the Lava Beds 1873, Apr. 15.

GILLENIA, *gĭl-lē'nĭ-a:* genus of plants of nat. ord. *Rosaceæ*, sub-order *Spiræcæ;* perennials, natives of the temperate parts of N. America. The roots are used in medicine as a mild emetic, and in small doses as a tonic; and are often called Indian Physic, sometimes *American Ipecacuanha, Indian Hippo, Dropwort,* and *Bowman's Root.* They grow to abt. 2 ft. in height, and are sometimes planted in shrubberies, for their graceful foliage.

GILLESPIE, George de Normandie, American Protestant Episcopal bishop: b. Goshen, N. Y., 1819, June 15. He was graduated from the General Theological Seminary in New York in 1840, entered the ministry and held rectorates at Leroy, N. Y.; Cincinnati, Ohio; Palmyra, N. Y., and Ann Arbor, Mich. In 1875 he was consecrated bishop of Western Michigan. He published *The Communion of Saints* and other religious works.

GILLESPIE, George Lewis: an American military officer; b. 1849; engineer in the Army of the Potomac, 1862–64; chief engineer in the Army of the Shenandoah; witnessed the surrender of Lee. During the American-Spanish war, 1898, he was appointed brig.-gen., and assigned to the command of the Department of the East. In 1900 he was on the board to set apart lands in Porto Rico for the military and naval purposes of the United States; promoted chief of engineers with the rank of brig.-gen., 1901.

GILLETTE, William, American actor and playwright: b. Hartford, Conn., 1853, July 24. He studied at the University of Boston, and at New York University; and in 1877 commenced his work on the stage, playing with different stock companies in New Orleans, Boston, New York, and other cities. He has since then acted important parts in many of his own plays. Among his best-known productions are: *The Professor* (1881); *Esmeralda* (1881), with Mrs. F. H. Burnett; *The Private Secretary; Held by the Enemy* (1886); *A Legal Wreck* (1888); *Too Much Johnson* (1895); *Secret Service* (1896); *Sherlock Holmes,* etc.

GILLIES, *gĭl'ĭz,* John, ll.d.: 1747, Jan. 18—1836, Feb. 5; b. Brechin, Forfarshire, Scotland. His youngest brother, Adam, was a judge of the court of session under the title Lord Gillies. Gillies was educated at the Univ. of Glasgow; and, after a time, went to London, with the view of following literature as a profession. For several years subsequently he was travelling tutor to the sons of John, second Earl of Hopetoun, who 1777 settled upon him an annuity for life. In 1778 he published a translation of the *Orations of Isocrates and those of Lysias, with some Account of their Lives,* 4to; and 1786 the first part of his *History of Ancient Greece* (2 vols. 4to, or 4 vols. 8vo). It was extremely popular on its first appearance, though much disfigured by verbosity, and dull and prolix dis-

quisition; but it has dropped out of notice since the advance of Greek scholarship in the present century, and the publication of the histories of Thirlwall and Grote. His *View of the Reign of Frederick II. of Prussia* appeared 1789, 8vo. In 1793, on the death of Dr. Robertson, he was appointed historiographer to the king for Scotland, with a yearly salary of £200. Among his works are, a translation from the Greek of *Aristotle's Ethics and Politics*, with an analysis of Aristotle's speculative works; *History of the World from Alexander to Augustus*, 2 vols., 4to (1807–10); *Translation of Aristotle's Rhetoric* (1823).

GILLIESIA, n. *gĭl-lēz′ĭ-a* [from Dr. *Gillies*, of Chili]: in *bot.*, typical genus of the small order *Gilliesiaceæ*, an order of exogens, alliance *Liliales*.

GILLISS, *gĭl′lĭs*, James Melvin: 1811, Sep. 6—1865, Feb. 9; b. Georgetown, D.C.: astronomer. He was appointed a midshipman in the U. S. navy 1826, was promoted passed midshipman 1831, studied science in the Univ. of Va. and in Paris, was appointed asst. in the depôt of charts and instruments in Washington 1836, organized the first working observatory in the United States, published the first vol. of astronomical observations, and prepared the first catalogue of stars. He was promoted lieut. 1838, given charge of the plans, construction, and arrangement of the U. S. naval observatory, made astronomical expeditions to various parts of the country and world, was an original member of the National Acad. of Sciences, and became supt. of the observatory 1861.

GILLMORE, *gĭl′mōr*, Quincy Adams, ph.d., u.s.a.: 1825, Feb. 28—1888, Apr. 7; b. Black River, Ohio: engineer. He was graduated at the U. S. Milit. Acad. 1849, entered the army as brev. 2d lieut. of engineers, was asst. engineer of the defenses of Hampton Roads, Va., instructor of military engineering at the U. S. Milit. Acad. 1852–6, promoted 1st lieut. and placed in charge of the engineer agency at New York 1856, promoted capt. 1861, and appointed engineer-in-chief of Gen. Sherman's Port Royal expedition. He planned, erected, and commanded the batteries on Tybee Island, which reduced Fort Pulaski 1862, Apr. 11, for which he was brevetted lieut.col. U.S.A.: was brevetted col. for services in Ky. 1863, Jan.; in June following was given command of the dept. of the South; and in July of the 10th army corps. While holding the last command he took possession of Morris Island, near Charleston, reduced and captured Fort Wagner and Battery Gregg, and virtually demolished Fort Sumter, with batteries 2 m. distant. For these services, pronounced by Gen. Halleck as 'constituting a new era in the science of engineering and gunnery,' he was brevetted brig-gen. U.S.A., and promoted maj.gen. vols. He was in command of Washington when threatened by the Confederates under Gen. Early 1864, July, resigned his vol. commission 1865, Dec., and was promoted col. of U. S. engineers 1883, Feb.

GILLS, n. *gilz* [AS. *geaflas;* F. *gifle*, the chaps, the jaws: Gael. *gial;* Sw. *gel*, a jaw, the gill of a fish: Dan. *giælle*, a gill]: the organs of respiration in fishes, reddish vascular folds on both sides of the head; the flaps below the beak of a fowl; in *bot.*, the thin, vertical, spore-bearing plates under the cap of certain fungi. GILL-BEARING, producing gills. GILL-FLAP, or GILL-LID, the covering of the gill; the operculum.

GILLS, or BRAN'CHIÆ: respiratory organs of those animals, e.g., fishes, which obtain the oxygen necessary for their well-being not directly from the atmosphere, but from the air held in solution in the water in which they live. In animals fitted for atmospheric respiration, the air enters the system to meet the blood, a peculiar set of movements, more or less complicated, being appointed for its constant renewal. In aquatic animals (excluding aquatic mammals), a different plan is required, in consequence of the small quantity of air contained in water; hence the aërating surface is extended outwardly, so as to yield a larger space than could be obtained in the interior. The blood is being perpetually driven along this surface, which is constructed to admit freely of the passage of air; and by the natural movements of the body, or by others of a special nature, a fresh supply of aërated water is constantly afforded. The chief forms of respiratory apparatus in different classes of animals are shown in the accompanying diagram, from Dr. Carpenter's *Comparative Physiology*. 'Let AB represent the general exterior surface of the body; then at *a* is shown the character of a simple *outward* extension of it, forming a foliaceous gill, such as is seen in the lower Crustacea; and in like manner, *b* may represent a simple *internal* prolongation or reflection, such as that which forms the pulmonary sac of the air-breathing gasteropods. A higher form of branchial apparatus is shown at *c*, the respiratory surface being extended by the subdivision of the gill into minute folds or filaments, as in fishes; and a more elevated form of the pulmonary apparatus is seen at *d*, the membranous surface extended by subdivision of the internal cavity, as

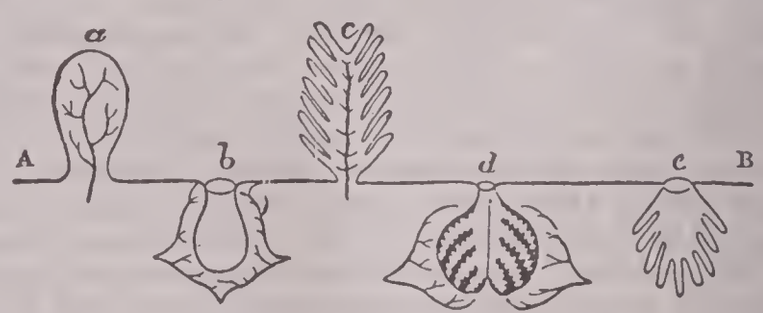


Fig. 1.

in birds and mammals. Lastly, at *e* is a plan of one of the 'pulmonary branchiæ' of the Arachnida, which forms a kind of transition between the two sets of organs—the extent of surface being given by gill-like plications of the membrane lining the interior, of a pulmonic cavity. See RESPIRATION, ORGANS AND PROCESS OF.

Noticing some of the different forms of G. in various

classes, we find in the Annelida the first distinct organs of this kind. Their blood is transmitted to a series of gill-tufts composed of a delicate membrane prolonged from the extreme surface, which may assume the form of branching trees or of delicate brushes made up of a bundle of separate filaments. These tufts are supplied freely with blood-vessels; and fresh portions of blood and of water are being constantly brought into contact by the natural movements both of the animal and of the surrounding medium, and by the action of the cilia covering the respiratory organs. The tufts are sometimes attached at intervals along the whole length of the body, as in *Arenicola*, in which there are 13 pair (see ANNELIDA); while in other cases they occur about the head only. In the latter case, they are extremely beautiful, having the appearance of a flower with the most brilliant tints. Two animals common in the aquarium, the *Serpula* and the *Terebella*, owe their resplendent beauty to these tufts (see figure under SERPULA). In all of the Crustacea, except some of the lowest forms, whose general surface is soft, G. are present. Thus the *Branchiopoda* are so called because their appendages present the form of simple plates or flattened vesicles, which swim in the surrounding fluid, and expose the blood to the oxygen which the water contains. The branchiæ may be appended to the thoracic limbs in the form of membranous plates (as in *Amphipoda*), or to the abdominal limbs as subdivided lamellæ (as in *Isopoda*), or the branchial plates may expand into vesicles attached to the thoracic feet (as in *Læmodipoda*). Among the *Stomapoda*, respiratory plates are external, and are appendages of distinct locomotive organs, each plate divided into a series of small filaments or tubes, so as to resemble a broad feather: their position is abdominal, as is seen in *Squilla*. Here the G. have begun to assume more of the character that they present in fishes, the laminated or leaf-like form being placed by one in which the surface is greatly extended by minute subdivisions into delicate filaments. In the order *Decapoda*, including the crab and lobster, the respiratory organs are tufts of filaments or lamellæ, and are lodged in branchial chambers protected by the carapace. A special apparatus, the 'scaphognathik,' consisting of the modified exopodite and endopodite of the second maxilla—beats rhythmically, so as to draw a constant current of water from behind forward over the aërating surface. The G. in these animals are in the form of long, slender, quadrangular pyramids, and consist either of numerous thin plates or minute cylinders arranged perpendicular to the axis of the pyramid. In crabs there are 9 such branchial pyramids on each side, in lobsters 20. For further details on the respiratory organs of the Crustacea, see Prof. Huxley's work on *The Crayfish*, International Science Series (Lond. 1880), or any of the larger works on the comparative anatomy and physiology of the invertebrates.

In the sub-kingdom Mollusca, there are several modifications of gills. In the *Lamellibranchiata*, or common bivalves, there are, as a general rule, two G. on each side.

Here the G. are delicate, highly vascular, vertical, leaf-like organs, formed by the union of numerous filaments into a perforated lattice-work covered with vibratile cilia, whose constant motion gives rise to regular respiratory currents: this form of gill may be readily examined in the oyster or common mussel. In the *branchiate gasteropoda*, the form and position of the G. are very variable. In the *Nudibranchiata* (see Alder and Hancock's splendid monograph on this order as occurring in the British seas—*Ray Society*), they are disposed, as their name implies, without any protection, over various parts of the body, where they often form beautiful tufts of delicate leaf-like or arborescent appendages, as in Doris (q.v). One of the arborescent processes forming the gills of *Doris Johnstoni* separated and magnified is shown in the accompanying fig. 2. The highest and most numerous subdivision of the branchiate gasteropoda—Cuvier's *Pectinibranchiata*—derived its name from the peculiar comb-like arrangement of the G., which lie in a special cavity at the fore part of the back, caused by an arching of the mantle. The G. of *Paludina vivipara* are shown in fig. 3. Finally, in the highest class of mollusks—*Cephalopoda*—the G. are the organs used for classification; there being two orders

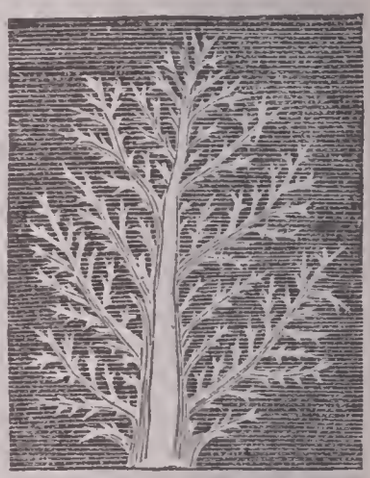


Fig. 2.—Gill-process of Doris, magnified.

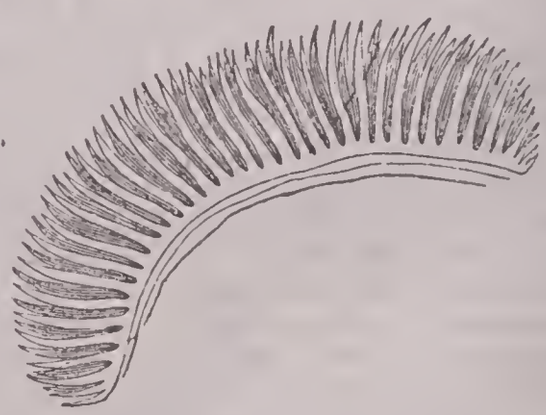


Fig. 3.
The pectinated branchiæ alone are seen. The concave surface rests on the intestine.

—viz., the *Tetrabranchiata*, with four gills, and the *Dibranchiata*, with two gills. The arrangement of these gills, and their relations to other organs, are seen in the accompanying figure of *Sepia* (fig. 4).

To the brief notice of G., under the title FISHES, remarks are here added, condensed from Prof. Owen's *Anatomy of the Vertebrates*, I. 475–488. In the *Cyclostomi*, which, except the lancelet, constitute the lowest order of fishes, and include the genera *Myxine* and *Petromyzon*, of which the hag and lamprey are examples, the branchiæ or

G. are sacciform, with external openings, and six or seven in number on each side. Each gill-sac receives its proper artery either from the branchial artery or one of its

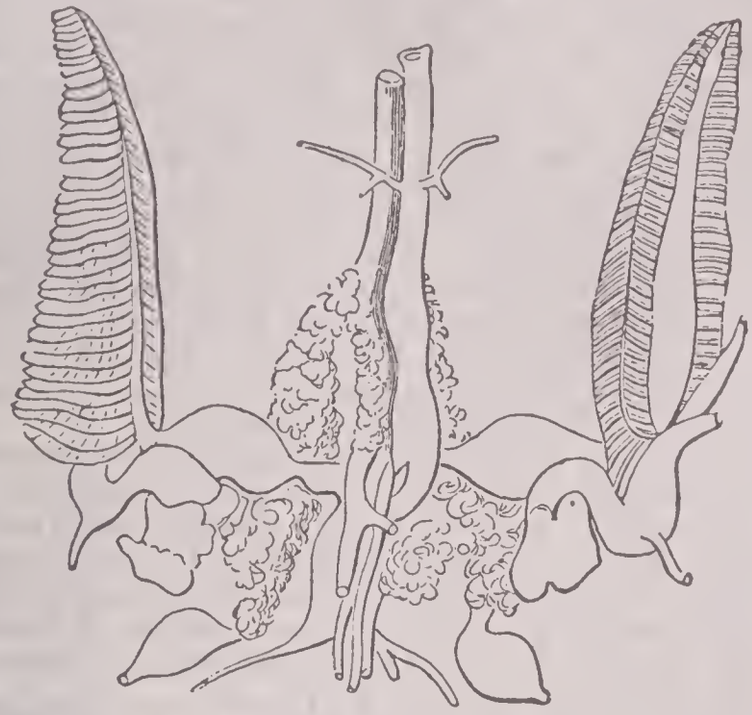


Fig. 4.—Sepia officinalis.

In the Dibranchiates, of which Sepia may be taken as an example, each gill consists of triangular vascular laminæ, extending transversely from either side of a fleshy glandular stem, and decreasing in size to the extremity of the gill. Each plate is composed of smaller transverse laminæ, which are themselves similarly subdivided; the entire gill presenting the tripinnated structure, which affords an extensive though close-packed surface for the subdivision of blood-vessels. The number of plates in a gill varies in different genera; in Sepia there are thirty-six pairs. The stem of the gill is not only attached by its base, but by a thin membrane, through most of its length, to the mantle. The above description, and the figure, have been borrowed from Owen's *Lectures on the Comparative Anatomy and Physiology of the Invertebrate Animals*, 2d edition, p. 624. The original figure is due to John Hunter.

branches. 'The leading condition of the G. in other fishes may be understood,' says Prof. Owen, 'by supposing each compressed sac of a Myxine (*m* in figs. 5 and 7) to be split through its plane, and each half to be glued by its outer smooth side to an intermediate septum, which

Fig. 5.—Two Gill-sacs of Bdellostoma.

Fig. 6.—Two Gill-sacs of Lamprey.

would then support the opposite halves of two distinct sacs, and expose their vascular mucous membrane to view. If the septum be attached by its entire margin, the condition of the gill in the *Plagiostomi* (sharks, dog-fish, rays, skates,

etc.) is effected. If the septum be liberated at the outer part of its circumference, and the vascular surfaces produced into pectinated lamelligerous processes, tufts or filaments proceeding from the free arch, the gill of an ordinary osseous fish is formed. Such a gill is the homologue, not of a single gill-sack, but of the contiguous halves of two distinct gill-sacs, in the Myxines. Already, in the lampreys, the first stage of this bi-partition may be seen (fig. 6), and the next stage in the sharks and rays; consequently, in these fishes a different artery goes to the anterior branchial surface of each sac or fissure from that which supplies the posterior branchial surface of the same fissure; whilst one branchial artery is appropriated to each supporting septum or arch between the fissures, as it is to the liberated septum or branchial arch in the ordinary osseous fishes.'—*Anatomy of Vertebrates*, I. 476.

The lampreys, myxinoids, and plagiostomes (sharks and rays) are termed fishes with 'fixed gills,' because in them each supporting septum of the anterior and posterior branchial mucous surfaces is attached to the pharyngeal and dermal integument by its entire outer margin, and the streams of water flow out by the same number of fissures in the skin (as at *k*, in figs. 5 and 6) as those by which they enter from the pharynx, *f*. In the osseous and in the ganoid fishes there are 'free gills,' the outer border of the supporting branchial arch being unattached to the skin, and playing freely backward and forward with its gill-surfaces, in a common gill-cavity, which has a single outlet, usually in the form of a vertical fissure.

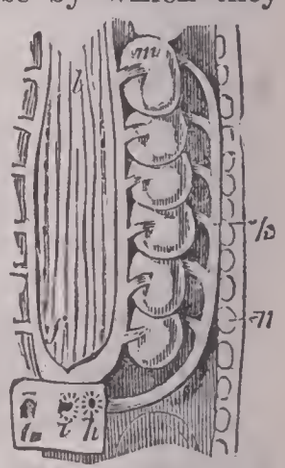


Fig. 7—Branchial Organs of Myxine.

In the myxinoids (as the hag) there are (see fig. 7) six or seven branchial sacs, *m*, on either side, and their outlets are produced into short tubes, which open into a longitudinal canal, *k*, directed backward, and discharging its contents by an orifice, *h*, near the middle line of the ventral surface; between the two outlets, *h*, *h*, is a third larger one, *i*, which communicates, by a short duct, with the end of the œsophagus, *l*, and admits the water, which passes from that tube by the lateral orifices, *f*, leading into the branchial sacs. These sacs have a highly vascular, but not a ciliated, mucous membrane, arranged in radiating primary and secondary folds to increase the surface. In the lampreys, there is a further separation of the respiratory from the digestive tract, for each gill is supplied from the so-called water-trachea, a median canal, beneath and distinct from the œsophagus.

In all the higher fishes, the inlets to the branchial interspaces lie on each side of the gullet, and are equal in number with the interspaces; while, except in the plagiostomes, there is apparently only one outlet on each side, which is under the operculum or gill-cover. These outlets vary extremely in size, being relatively largest in the herring and

mackerel families, smallest in the eels and lophioid fishes (as the Angler, q.v.). The length of time that different fishes can exist out of water depends on the modifications for retaining water in the branchial chambers. As a general rule, the chamber is largest when the outlet is smallest, as in the eels, blennies, and lophioids, and these are the fishes that survive the longest out of water, except in such cases as the climbing perch (q.v.) or *Anabas*, in which the branchial apparatus possesses complex labyrinthic appendages. The main object of the G. of fishes being to expose the venous blood, in very thin-walled vessels, to streams of water, the branchial arteries rapidly sub-divide into capillaries, which constitute a net-work in one layer, supported by an elastic plate, and covered by a tessellated but non-ciliated epithelium. This covering and the capillary wall are so thin as to admit free interchange to take place between the blood, loaded with carbonic acid, on the one hand, and the aërated water on the other. The extent of respiratory surface is increased in various ways, of which by far the most common is, 'by the production of the capillary-supporting plates from each side of long, compressed, slender, pointed processes, extending, like the teeth of a comb, but in a double row, from the convex side of each branchial arch.' In this figure, the course of the blood through a pair of branchial processes is shown; *a* is a section of the branchial artery; *d* is the branch going along the outer margin of the process; *e* is the vessel receiving the blood from the capillaries, after it has been changed, and returning it, along the inner border of the process, to the branchial vein, *c*. The number of vascular plates or lamellæ attached to each branchial process has been estimated at 135 in the carp, 700 in the eel, 1,000 in the cod, 1,400 in the salmon, and 1,600 in the sturgeon.

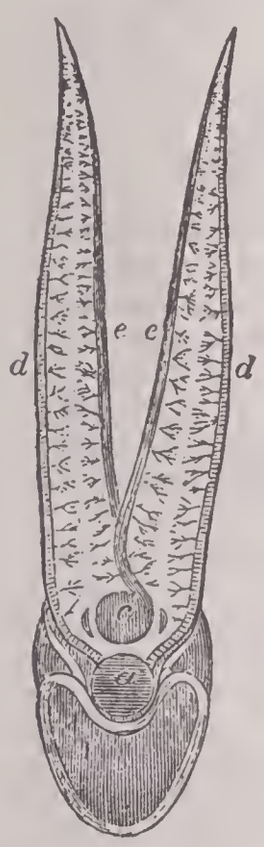


Fig. 8.—Diagram of the circulation of the blood through the Branchial Leaflets.

From the ordinary type of gill in fishes, we pass to consider these organs in Amphibia or Batrachia. In the lower or perennibranchiate members of this order, the G. exist permanently, but in the great majority they are mere temporary organs: see BATRACHIA. In the newt (*Triton*), a little animal easily kept in a vessel of fresh water, three pairs of external G. are developed, at first as simple filaments, each with a capillary loop, but speedily expanding and giving off looplets. The gill is covered with ciliated epithelium, which loses the cilia before the absorption of the organ, and this takes place after a few days of larval existence. In the larval frog, the G., which are on a simpler plan, diminish about the 4th, and disappear on the 7th day. The parts of the branchial framework

which supports the deciduous G. never develop beyond the cartilaginous stage: thus they readily shrink, and become more internal as the head increases in size. The G. of the

Fig. 9.—Head and Branchial Appendages of the Larva of a Newt, magnified.

perennibranchiate amphibians completely resemble those already described, and similar temporary external G. occur in young plagiostome fishes.

GILLY, or GILLIE, n. *gĭl'lĭ*, GIL'LIES, n. plu. *-lĭz* [Gael. *gille*, a servant-man, a lad: Ir. *giolla*, a boy]: in *Scot.*, a man or lad who attends on a sportsman, or who is employed in protecting game.

GILLYFLOWER, n. *jĭl'ĭ-flow'er* [F. *giroflée*, a gilly-flower—from It. *garofalo;* L. *caryophyllus*, a clove]: popular name for some of the cruciferous plants most prized for the beauty and fragrance of their flowers, as wall-flower, stock, etc. The clove-pink also, the wild original of the carnation, is called *Clove-Gillyflower*. The name G. has been regarded as a corruption of *July-flower;* but in Chaucer it appears in the form *gilofre;* and the French *giroflée* indicates the true derivation from *girofle*, a clove, the smell of the Clove-G. being somewhat like that of cloves.

GILMAN, *gĭl'man*, DANIEL COIT, LL.D.: educator: b. Norwich, Conn., 1831, July 6. He graduated at Yale College 1852, spent three years in European study and travel, became librarian in Yale College 1855, afterward prof. of physical and political geography there, sec. of the Sheffield Scientific School board, supt. of public schools in New Haven, and sec. of the Conn. board of education. In 1870 he declined and in 1872 accepted the presidency of the Univ. of Cal., and in 1875 was elected first pres. of Johns Hopkins Univ., Baltimore. He was one of the original trustees of the John F. Slater Fund for the education of freedmen, and has been its sec., and pres. of the American Social Science Assoc. He is author of numerous addresses and papers on scientific and educational topics. He received the degree LL.D. from Harvard Univ. 1876 and Columbia College 1887.

In 1896–7 he served on the commission to settle the boundary dispute between British Guiana and Venezuela, and in the latter year was a member of the commission to draft a new charter for Baltimore. In 1901 he resigned the presidency of Johns Hopkins University, and became editor-in-chief of the revised edition of the *International Cyclopedia.* From 1902-04 he was president of the Carnegie Institution at Washington. His publications include *Life of James Monroe; University Problems; Introduction* to De Tocqueville's *Democracy in America,* etc. D. 1908, Oct. 13.

GILMORE, *gĭl′mōr,* James Roberts: author: b. Boston, 1823, Sep. 10. He was educated for commercial business, became head of a cotton and shipping firm in New York 1848, and retired 1857. He began writing novels, war-songs and ballads under the pseudonym of 'Edmund Kirke' in the early part of the civil war, founded the *Continental Monthly* to advocate emancipation 1862, and had an unofficial interview with Jefferson Davis with the hope of restoring peace 1864. He was again in business 1873-83. His works include *Among the Pines* (1862); *Down in Tennessee* (1863); *Among the Guerillas* (1863); *Adrift in Dixie* (1863); *On the Border* (1864); *Patriot Boys* (1864); *Gospel History* (in conjunction with Dr. Lyman Abbott, 1880); *Life of Garfield* (1880); *The Rear Guard of the Revolution* (1886); *John Sevier as a Commonwealth Builder* (1887); and a series of histories of the s.w. states 1888–9. D. 1903.

GILOLO, *jĕ-lō′lō,* or Halmahera, *hâl-mā-hā′râ:* one of the Moluccas or Spice Islands, between 2° n. and 1° s. lat., and 127° 27′—129° e. long.; e. of Celebes. 6,300 sq. m. It is very irregular in form, and consists of four peninsulas. It was formerly ruled by several native sultans and other princes, but now belongs to the Netherlands. Maylays live on the coasts, Alfoors island. The island is mountainous, and covered with forests. Gold is found. There are buffaloes, oxen, wild swine, goats, etc. The soil is fertile, producing cocoa-nuts, sago, spices, bananas, bread-fruit, and fine wood. The exports are: edible nests, pearls, gold, mother-of-pearl, sago, spices, trepang, and tortoise-shell. The imports: opium, iron, cotton, manufactured and fancy goods. Pop., including neighboring small islands, 27,500.

GILPIN, *gĭl′pĭn,* Bernard: 1517–1583, Mar. 4; b. Kentmire, Westmoreland, England: ecclesiastic. He was educated at Queen's College, Oxford, converted to Protestantism by public disputations with Hooper and Peter Martyr, and was appointed vicar of Norton, in the diocese of Durham, 1552. The same year he preached before King Edward VI. and was licensed to preach throughout the kingdom as long as the king lived. He then resigned his vicarage, pursued theological investigations at Louvain, Antwerp, and Paris, and returning to England near the close of Queen Mary's reign, was appointed archdeacon of Durham by his

uncle the bp. Dr. Tonstall His sermons were characterized by extreme boldness, and he mercilessly attacked the vices of the clergy. For this charges were preferred against him to the bp., who not only dismissed them but appointed his nephew to the rich living of Houghton. Twice he was protected by his uncle. A third set of charges was preferred to the bp. of London, Dr. Bonner, who ordered his apprehension. He started for London, saying he was going to the stake, broke his leg on the way, and was laid up till the death of Queen Mary relieved him of apprehensions of personal danger. He returned to Houghton, declined the bishopric of Carlisle tendered by Queen Elizabeth, kept open house for his parishioners every Sunday from Michaelmas to Easter, built and endowed a grammar school, educated and maintained a large number of poor children at his own expense, provided the most promising scholars with means of pursuing a univ. education, and transformed a part of his domicile into a boarding-house to accommodate the large number of young people who flocked to his school. Every year he made a missionary tour of Northumberland, Yorkshire, Cheshire, Westmoreland, and Cumberland, whence he was called the 'Apostle af the North,' and personally maintained an asst. in his own parish. He lived frugally, gave away nearly all his annual income, and was exceedingly popular as rector and friend through the large field of his benevolent and pastoral operations.

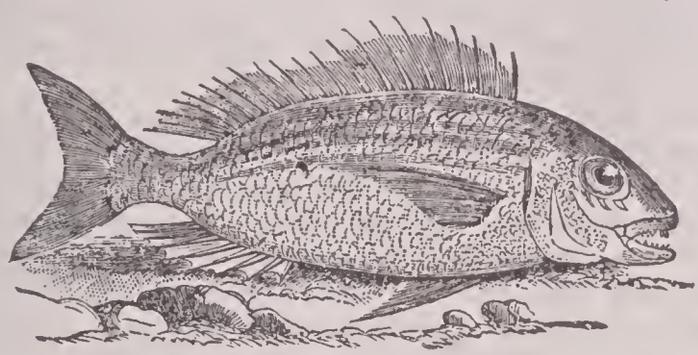
GIL POLO, *ċhēl pō'lō*, GASPAR: Spanish poet: b. Valencia, first half of the 16th c. While town clerk of his native place, he was called by Philip II., 1572, to high financial office in the kingdom of Valencia; and 1580 was sent to superintend the royal patrimony at Barcelona, where he died. Besides various lyrics, he wrote a continuation of Montemayor's *Diana*, which appeared 1564. Though inferior to the original romance in invention, Gil Polo's continuation so greatly surpasses it in clearness of thought and expression throughout the metrical portions, that Cervantes exempts it from the condemnation of Don Quixote's other books as deserving as much respect 'as though Apollo himself had written it.' The best ed. is that of Cerda (Madrid 1778; new ed. 1802). Biographers generally have confounded Gil Polo with his son.

GILSONITE: see ASPHALT.

GILT, v. *gĭlt* [see GILD and GOLD]: ADJ. overlaid with gold-leaf: N. gold laid on the surface of a thing; golden or outside show.

GILTHEAD, *gĭlt'hĕd* (*Chrysophrys*): genus of acanthopterous fishes of the family *Sparidæ*, having a deep compressed body, a single dorsal fin, the anterior rays of which are spinous, the cheeks and gill-covers covered with scales, the teeth of two kinds, six conical teeth in front of each jaw, and four rows of oval rounded grinding-teeth in the upper jaw, three rows in the lower. They feed chiefly on mollusks, the shells of which their teeth enable then to crush to pieces. The species are numerous; in-

habitants of the warmer seas. One species, the COMMON G. (*C. aurata*) abounds in the Mediterranean, and is much esteemed for the table. It seldom attains a length of more than twelve inches. It is generally found near the shore, in small shoals, and its presence is sometimes betrayed to fishermen by the noise which its teeth make in crushing shells. It is said to agitate the sand with its tail, in order to get access to the mollusks concealed in it. The back is silvery gray, shaded with blue; the belly like polished steel; the sides have golden bands; and there is a half-moon-shaped golden spot between the eyes, from



Common Gilthead (*Chrysophrys aurata*).

which it derives the name G., the Latin name *Aurata* (gilded), and the Greek name *Chrysophrys* (golden eyebrow). From the Latin *Aurata* comes the French name *Dorade*. This fish was frequently kept in the *vivaria* of the ancient Romans, being much valued and easily fattened. Another species (*C. microdon*) also is found in the Mediterranean.—The name G. is given also to a British fish of a different family (*Labridæ*), a species of Wrasse (q.v.).

GILT JEWELRY—GILT TOYS: small articles, coated with gold; chiefly the cheap jewelry formerly manufactured almost exclusively at Birmingham, England; now made in various places in Britain, America, and other countries. The name in the English trade is Gilt Toys. Cheap jewelry of the most elegant forms is made from copper, which is drawn through rollers into small ribbons and wires, with elegantly embossed surfaces to represent the fine chasing on articles made from the precious metals. These the gilt-toy maker twists and solders into brooches, bracelets, rings, and a variety of trinkets, usually with a raised *bezell* for receiving a piece of polished colored glass, or a cheap stone. Previous to setting the glass or stone, the trinkets are strung on copper wires, and sent to the electro-plater, who gives them a coating of gold or silver, and returns them to the gilt-toy maker, who finishes them by burnishing and by setting the imitation gems. In this way a vast amount of really beautiful imitation jewelry, not easily distinguished by the eye from genuine, is produced at very small cost.

GIMBALS, n. plu. *gĭm'bălz* [L. *gemellus; gemello*, a twin—from L. *gemĭnus*, twin, double: F. *jumelles*, twins]: pairs of brass hoops or rings moving within one another on

diameters at right angles to each other, so that anything suspended in their centre will always retain a constant position. The apparatus on board a ship to which the mariner's compass is attached is an example. The outer hoop is attached to a box or other fixed object, while the inner hoop is constructed to allow of its moving freely within the outer, to which it is attached by two pivots at the extremities of a diameter. The compass-box is attached to the inner hoop by two similar pivots at right angles to the former. Thus the compass moves freely in two directions at right angles to each other, and can always retain its horizontal position, however the vessel may roll or pitch. G. are often applied to other instruments, such as the mountain barometer, etc.

GIMCRACK, n. *jĭm'krăk* [OE. *gimmals*, or *gimmers*, the corresponding members of a joint working into each other —applied to the mechanism for moving idols and puppets: L. *gemellī*, twins]: any trivial mechanism; a device; a toy. *Note.*—It is suggested that *gim* is for *gin*, an engine, a contrivance, and OE. *crack*, a lively, spirited boy.

GIMIGNANO, *jē-mēn-yâ'nō*, SAN: ancient town in the Italian province of Siena, 22 m. from Florence, on a hill 1,220 ft. above the sea. Of the many churches and monasteries which the town formerly contained, most are in ruins. Some still standing contain some fine old frescoes. Pop. 4,000.

GIMLET, or GIMBLET, n. *gĭm'lĕt* [OF. *gimbelet;* F. *gibelet*, a gimlet: prov. F. *jhimbla*, to twist (see WIMBLE)]: small boring tool; a large one of the same kind is called an *auger*. Generally used when the hole is to be larger than can be bored with a brad-awl: it has a conical screw point, above which is a groove for clearing, and is fitted in a cross or T. handle. An improvement has been made by twisting the grooved part of the gimlet, so that it forms a long spiral groove. GIMLET, v. in a *ship*, to turn round an anchor by the stock. GIM'LETING, imp. GIM'LETED, pp.

GIMLI: in *Scandinavian myth.*, the dwelling-place of good men for eternity; a vast hall at the world's southern limit, of a radiance beyond that of the sun; the Norse Heaven.

GIMMALS, n. plu. *gĭm'ălz*, or GIMMERS, n. *gĭm'mẽrz* [L. *gemellī*, twins]: in *OE.*, a twin or double ring; rings or the corresponding parts of a joint working into each other, as the two parts of a hinge.

GIMMER, n. *gĭm'mẽr* [connected with OE. *gimmals*, or *gimmers*, a twin or double ring, jointed hinges: L. *gemellus*, a twin]: in *Scot.*, a ewe in its second year, which has had its first lamb; in *OE.*, movement; machinery. GIMMERS: see GIMMALS.

GIMP, n. *gĭmp* [Ger. *gimf*, lace or edging of silk: F. *guipure*, lace—from *guiper*, to cover or whip about with silk]: kind of interlaced silk, wool, or cotton twist or edg-

ing, used for trimmings, for dress, curtains, furniture, etc., often beaded: its peculiarity is that fine wire is twisted into the thin cord of which it is made.

GIN, n. *jĭn* [contraction of L. *ingĕnĭŭm*, natural disposition, invention, or F. *engin*, an engine, understanding: Icel. *ginna*, to allure, to deceive: comp. Gael. *dinn*=*jĭn*, to press, to trample out]: contrivance; snare; trap; machine for driving piles, or for raising and moving heavy weights. V. to catch in a trap; to separate the seeds from the cotton by a machine. GIN'NING, imp.: N. the act or process of clearing cotton from seeds. GINNED, pp. a. *jĭnd*, caught in a trap; cleared from seeds, as cotton. COTTON-GIN, a machine for separating raw cotton (q.v.) from its seeds.

GIN, v. *gĭn* [AS. *ginnan*, to begin]: in *OE.*, to begin. BEGIN is a mere derivation from the older form *gin*. GIN'NING, imp. GINNED, pp. *gĭnd*.

GIN: machine for raising weights, driving piles, etc.; consisting of three poles, 12 to 15 ft. long, and 5 inches in diameter at the lower end, tapering to $3\frac{1}{2}$ inches at the upper. The poles are united at the top, either by an iron ring which passes through them or by a rope twisted several times round each, and to this 'joint' a pulley is fixed. Two of the poles are kept at an invariable distance by means of an iron rod, in order that they may support the windlass attached to them, its pivots running in iron cheeks fixed to the poles. The Gin is set up over the weight to be raised; two blocks arranged according to the second system of pulleys (q.v.) are fixed, one to the top of the poles, the other to the weight; and the rope, after passing round both blocks, and over the pulley above mentioned, is attached to the windlass, by the revolution of which the weight can then be raised.—The Gin used for raising coal. etc,, and for communicating motion to thrashing mills, consists of an erect axis or drum, firmly fixed in sockets, to which are attached transverse beams, varying in number according to the power required. To the extremity of each beam a horse is yoked, and they are then driven round in a circle. If coal is to be raised, the horses must either be frequently unyoked, and turned in the opposite way, or the machine must be made reversible; the latter of which is preferable, as saving time and labor. This Gin has mostly been superseded by the steam-engine.

GIN, n. *jĭn* [contraction from Dutch *genever*, corrupted fr. F. *genièvre*, juniper-berry, gin: the Fr. word is fr. *Genēva*, the town where made]: a compounded spirit, prepared by redistilling plain spirit with juniper berries, coriander seeds, angelica root, etc., or by adding various essential oils to rectified spirit. The gin produced by distilling possesses a much more delicate flavor than that produced by mixing or compounding. The original distillation may be made from malt or from unmalted grain. Gin was first made in Holland notably at Schiedam. The

strength of Gin varies from proof to 50 under proof, and it is liable to much injurious adulteration.

GINCKELL, *gĭnk'ĕl*, GODART VAN, first Earl of Athlone: 1640–1703; b. Guelderland, Holland: soldier. The head of an ancient and noble family and bearing the title Baron van Reede, he entered the Dutch army when a youth, followed William of Orange on his expedition to England 1688, and distinguished himself as an officer by pursuing, defeating and capturing the Scotch regt., that had mutinied at Ipswich and was returning to Scotland 1689. In the following year he went to Ireland with William III., and took part in the battle of the Boyne as commander of the Dutch cavalry. When the king returned to England he vested the conduct of the war in Ginckell, who established headquarters at Mullingar, took the field early in 1691, captured the fortress at Ballymore with all its garrison June, reconstructed the works, then marched to the fortified town of Athlone, whose garrison was commanded by the French gen. Saint-Ruth, attacked it June 19 and successfully stormed it 30th, and after the retreat of the Irish army to Aghrim, repaired the Athlone fortifications, garrisoned the town, and led the English to Aghrim July 12. An attack was made immediately, and the Irish offered a stubborn resistance till the fall of Saint-Ruth, when they became disorganized, were defeated, and fled. Ginckell next took Galway, permitting its garrison to retire to Limerick where Tyrconnel, the viceroy, was in command of a large force. The viceroy died early in Aug., and the same day Ginckell reached the place and began bombarding. He captured the Irish cavalry on the other side of the Shannon, stormed the fort on Thomond bridge, forced a capitulation, and thus completed the conquest of Ireland. For his military services he received the thanks of the house of commons, was created by the king first Earl of Athlone and Baron of Aghrim, and for a time was in possession of the fortified estate of the Earl of Limerick. Subsequently he accompanied the king to the continent, and took command of the Dutch serving under the Duke of Marlborough 1702. The title became extinct 1844.

GINGAL, *jĭn'gal*, or JINGALL [see JINGALL]: musket used in Asia; large and clumsy, fired from a rest.

GINGER, *jĭn'jer* [O.F. *gengibre;* F. *gingembre;* L. *zingiber;* It. *zinzibo*, ginger], (*Zingiber*): genus of plants of nat. ord. *Scitamineæ* or *Zingiberaceæ*, having the inner limb of the perianth destitute of lateral inner lobes, and the fertile stamen prolonged beyond the anther into an awl-shaped horn. The species are perennial herbaceous plants with annual stems, and creeping root-stocks (*rhizomes*); the stems produce leaves in two opposite rows; the flowers are in compact spikes with bracts. They are natives of the E. Indies. The root-stocks of most of the species are used as a condiment and in medicine. The most valuable and generally used are those of the COMMON GINGER (*Z.*

officinale), sometimes distinguished as the narrow-leaved ginger, which has been cultivated in the E. Indies from time immemorial, and is now cultivated in other tropical countries, particularly the W. Indies and Sierra Leone, from all which countries its root-stocks—the ginger of commerce—are a considerable article of export. The root-stock is about the thickness of a man's finger, knotty, fibrous, and fleshy when fresh. The stems which it sends up are reedlike, invested with the smooth sheaths of the leaves, generally three or four ft. high. The leaves are linear-lanceolate and smooth. The flowers are produced not on the leafy stems, but on short leafless stems (scapes), in spikes about the size of a man's thumb, and are of whitish color, the lip streaked with purple. The cultivation of ginger is extremely easy wherever the climate is suitable. In India it is carried on in moist situations as high as four or five thousand ft. on the Himalayas. The root-stock is taken up when the stems have withered, and is prepared for the market either by seething and scalding in boiling water—to kill it—and subsequent drying, or by scraping and washing. The first method yields *Black Ginger*, the second *White Ginger;* the blackest of Black Ginger, however, being only of stone-color, and the whitest of White Ginger very far from white, unless bleaching by chloride of lime be afterward employed, as it frequently is, to improve its appearance, though not beneficial to its quality. There is considerable difference, however, in the original color of the root-stock in the ginger of different countries, supposed to result from difference in the varieties cultivated. The uses of ginger both in medicine as a stimulant and carminative, and in domestic economy as a condiment, are familiar. Its qualities depend much on a pale yellow volatile oil, lighter than water, called *Oil of Ginger*. It contains also considerable starch.—*Candied Ginger*, or *Preserved Ginger*, consists of the young root-stocks preserved in sugar, and is now exported from China, the E. Indies, and the W. Indies. It is a pleasant sweetmeat and useful as a stomachic.—*Essence of Ginger*, much used for flavoring, is in reality a tincture, prepared of Ginger and alcohol.—*Syrup of Ginger* is used chiefly by druggists for flavoring.—*Ginger Tea* is a domestic remedy considered useful in flatulence, and is an infusion of ginger in boiling water, or a mixture of a small quantity of the tincture in hot water. Ginger was known to the Romans, and is said by Pliny to have been brought from Arabia.—Another species of ginger is ZERUMBET (*Z. zerumbet*), called also Broad-leaved ginger, cultivated in Java, of which the root-stock is sometimes erroneously called Round Zedoary. The root-stock is much thicker than that of common ginger, and less pungent.—The root-stock of the CASSUMUNAR (*Z. cassumunar*), sometimes called Yellow Zedoary, has a camphor-like smell and a bitter, aromatic taste. It acquired high reputation as a medicine in England and throughout Europe about the close of the 17th c., but having been extolled

not merely as a stimulant and stomachic, but as possessing virtues which it has not, it soon sank into oblivion.—The root-stock of the MIOGA (*Z. mioga*) is less pungent than ginger, and is much used in Japan.—Cattle sent to graze in the jungles of n. India, during the rainy season, are supplied with the root-stocks of a species of ginger (*Z. capitatum*), to preserve their health.—The root of *Aristolochia* (q.v.) *Canadense* is sometimes called *Indian Ginger* or *Wild Ginger* in N. America, and is used as a substitute for ginger.

GIN'GER-BEER: effervescing drink made by fermenting ginger, sugar, and some other ingredients, and bottling before the fermentation is completed. The following recipes are among the best known: Lump sugar 5 lbs.; crushed Jamaica ginger (unbleached is best) 5 oz.; cream of tartar, 4 oz.; 10 lemons, sliced; and 5 gallons of boiling water. They should be mixed in a vessel which can be kept covered until cool, but require stirring from time to time as the cooling goes on. When lukewarm, add 10 oz. of yeast, and keep it in a warm place to encourage the fermentation, which soon commences; after one day's fermentation, strain through a flannel filter, and let it stand to ferment again for a short time; then take off the scum, and bottle. The bottle must be tied or wired down. Another recipe is: Cream of tartar, 3 oz.; ginger, 1 oz.; refined sugar, 1½ lbs.; 1 sliced lemon; 1½ gallons boiling water; 1 oz. yeast; treated as above.

GIN'GERBREAD: article of food, in vogue certainly since the 14th c., when it was made and sold in Paris, according to Monteil in his *Histoire des Français* (II. 47, 48); it was then made of rye dough, kneaded with ginger and other spice, and honey or sugar. It was probably introduced into England by the court of Henry IV., and is in familiar household use in that country and in America. The expensive honey early gave way to the cheaper treacle, and the color was hidden under some coloring matter or gilding. 'To take the gilt off the gingerbread,' has become a proverb; and gilded gingerbread is still occasionally seen. Three forms of gingerbread are common. 1. Square soft cakes, from two to three inches in thickness. 2. Thin cakes of various forms, but usually round, stamped out with the top of a wine-glass, or other contrivance. 3. Small button-like cakes, called gingerbread-nuts. The last two should be baked very quickly, crispness being indispensable.

GINGERLY, ad. *jĭn'jĕr-lĭ* [AS. *gyng*, young, tender; *gyngre*, younger, more tender: prov. Sw. *gingla*, to go gently]: cautiously; carefully, as from delicacy or timidity.

GIN'GER-WINE: cheap liqueur, partly of domestic manufacture, and partly made on a larger scale for sale. It may be made by dissolving about 6 lbs. of sugar in 14 gallons of water; adding 4 oz. of bruised ginger and the whites of 2 eggs, well beaten (chopped raisins may be added); mixing all thoroughly; boiling for a quarter of an hour; skimming carefully; and when the liquor has

cooled, adding the juice of 4 lemons, also their rinds for flavoring, with a tea-cupful of ale-yeast to promote fermentation; letting it ferment in an open vessel 24 hours, and then putting it into a cask of suitable size, closely bunged, in which it remains for a fortnight, before it is bottled. It is very common to increase the strength of G.-W. by addition of spirits, the flavor also being modified by the kind of spirits. A little spirits added makes G.-W. keep well, and it even improves in quality for many months. Its quality depends much on that of the sugar and of the ginger employed, also on care in the manufacture.

GINGHAM, n. *gĭng'ăm* [Fr. *guingan*—said to be from *Guingamp*, in Brittany, France: comp. Javanese *ginggang*]: cotton cloth, the yarn of which is dyed before being woven—thus distinguished from printed cotton or prints. This fabric with its name was introduced into Britain from India; now British manufacture supplies the Indian market. At first the Indian ginghams consisted of cotton cloths, with two or more colors arranged as a small checkered pattern; now, a great variety of designs are found, and in umbrella ginghams, the whole piece is woven with yarn of one color. The following are the chief kinds of G. known in the markets of Great Britain: plain common light grounds; plain common dark grounds; Earlston ginghams; power-loom seersuckers and checks (imitations of the Indian patterns); muslin ground (stripes and checks); furniture stripes and checks; colored diapers; crossover stripes; derries, Hungarians; jean stripes, and umbrella ginghams.

GINGILIE OIL, *jĭn'jĭl-ĭ:* bland fixed oil obtained by expression from the seeds of *Sesamum Indicum:* see SESAMUM.

GINGIVÆ, n. plu. *jĭn-jī'vē* [L. *gingīva*, a gum]: the gums; a dense fibrous tissue, very closely connected with the periosteum of the alveolar processes, and covered by a red mucous membrane. GINGIVAL, a. *jĭn'jĭ-văl*, of or pertaining to the gums. GINGIVITIS, n. *jĭn'jĭ-vī'tĭs*, inflammation of the gums.

GINGKO, *jĭng'ko*, or GINKO, *jĭn'ko* (*Salisburia adiantifolia*): large tree of nat. ord. *Taxaceæ* (yew, etc.), with straight erect trunk and conical head, and leaves remarkably resembling the leaflets of the fronds of maidenhair, somewhat triangular, cloven and notched at the upper extremity, shortly stalked, leathery, smooth, shining, yellowish green, with numerous minute parallel ribs, and somewhat thickened margins. The fruit is a sort of drupe, of which the fleshy part is formed by the persistent calyx, about an inch in diameter; the nut or endocarp white, a thin shell with a farinaceous kernel resembling an almond in flavor with a little mixture of austerity. The tree is a native of China, but has been long known in Europe, and large trees are now seen in England. The wood is easy to work, receives a fine polish, is yellowish white, veined, and not resinous. In China and Japan, the

G. is grown chiefly for the kernel, which is freed from austerity by boiling and roasting. The fleshy part of the fruit, though resinous and astringent, is eaten after being

Gingko:
a, branchlet of female tree; *b*, branchlet of male tree, in flower; *c*, male flowers; *d*, female flowers; *e*, fruit; *f*, anther.

slightly roasted. The male and female flowers are on different trees; but the Chinese plant several close together, which grow into a monstrous tree, producing both male and female flowers.

GINGLE, n. *jĭn'gl:* see JINGLE.

GINGLYMUS, n. *gĭng'glĭ-mŭs* [Gr. *gingglŭmŏs*, a hinge or joint]: a joint allowing motion in two directions only, as the joint of the elbow and lower jaw. GIN'GLYMOID, a. *-moyd* [Gr. *eidos*, resemblance]: resembling a hinge.

GINNUNGA-GAP: in Norse myth., the primeval abyss; the abyss of abysses: see SCANDINAVIAN MYTHOLOGY.

GINSENG, n. *jĭn'sĕng* [Chinese, *genseng*, first of plants]: Asiatic plant, whose root, of aromatic flavor, is highly esteemed as a medicine among the Chinese, being universally regarded as possessing extraordinary virtues, and as a remedy for almost all diseases, but particularly for exhaustion of body or mind. The root is sold sometimes for its weight in gold. It was once introduced into Europe, but

Ginseng (*Panax quinquefolium*).

soon forgotten. The G. is a species of *Panax*, of nat. ord. *Araliaceæ*, to which the name *P. Ginseng* has been given, and which is a native of Chinese Tartary; having a stem one ft. to two ft. high, leaves on long stalks, five-fingered, and almost quite smooth; and umbels on a long terminal stalk. It is doubted by many botanists if this species is really distinct from *P. quinquefolium*, a common N. American plant; the root of which is now an article of export from N. America to China, and is used as a domestic medicine in the states w. of the Alleghanies, but which European and American medical practitioners generally regard as almost worthless. It is mucilaginous, sweetish, and slightly bitter and aromatic.—*P. fruticosus* and *P. cochleatus* are fragrant aromatics, growing in the Moluccas, and used by the native practitioners of India.—The fruit of the genus *Panax* is succulent, compressed, with two or three leathery one-seeded cells.

GIOBERTI, *jo-bĕr'tē*, Vincenzo: 1801–1852, Oct. 26; b. Turin: ablest philosophical writer of modern Italy. He was educated for the church, obtained the degree doctor of theology 1823, and was ordained to the priesthood 1825. He was appointed prof. of theology in the univ. of his native city, and from the accession of Charles Albert till 1833 was chaplain to the court. At this period of rising political agitation, G. was accused of promoting the liberal movement, was dismissed from court, and imprisoned four months. Having obtained permission to retire into exile, he went first to Paris, and soon to Brussels, where he spent 11 years as private tutor in an academy, pursuing in his leisure hours his private studies. A devout Rom. Cath., G. looked on the papacy as the divinely appointed agency for the elevation of Italy among the nations. A confederation of states subject to papal arbitration, and having in the king of Piedmont a military protector, was the scheme devised by G. for the unity and regeneration of his country. In short, in the 19th c. he advocated the Guelph policy of the middle ages. These views he elaborately developed in his work entitled, *Il Primato Civile e Morale degli Italiani* (The Civil and Moral Supremacy of the Italians). Its publication in Paris 1842, during the author's exile, was hailed with enthusiasm by Italy, with the exception of a limited and far-sighted section of the country. The liberal and conciliative policy adopted by Rome on the accession of Pius IX., appeared the verification of G.'s predictions, and increased his popularity. On his return to Italy, he was received with ovations from all classes of people, and chosen by several towns as their representative in parliament. The king appointed him senator, he subsequently was elected pres. of the chamber of deputies, and finally prime minister; but owing to the great divergence of opinion among his ministry, he held office only a few weeks. His successor dispatched him to Paris on some unimportant mission, in order it was thought to remove him from Turin; and thus ended G.'s political career. Broken in spirit by the failure of his plans for his country, he died at Paris, of apoplexy. As a politician, G. failed in far-sight-

edness; and with the course of events in Italy, his influence as a political guide inevitably declined; but the depth and range of thought and strength of conviction evinced in his various works, give him high standing as writer and thinker. G.'s remarkable gentleness in private intercourse gave no sign of the force with which his writings propound an opinion or denounce an opponent.

G.'s system of philosophy stands apart from modern schools of thought. In his *Introduction to Philosophy* (Paris 1839) he teaches that the source of all human knowledge is in God. 'The name which he gives it is "The Idea or Thought." This is communicated to man in proportion as he is capable of receiving it and is "the light which lighteth every man that cometh into the world." Man receives it by his reason, which is capable of directly beholding it. Supernatural knowledge can be conveyed only by means of language, and divine truths are not seen by intuition but are believed. The basis of all knowledge is the knowledge of being, not of its abstract idea, but of the personal Being, God himself acting as a cause and producing existences. The knowledge of this being is gained by revelation through the written word wherein he declares himself "*I am that I am.*" As God is the only Being, all other things are "existences:" and man learns from the written word that the One Being creates existences; not that he extends himself into these various manifestations, as Hegel says; not that he cause them to emanate from himself, as other pantheists say; but that he *creates* them. Nothing but the act of creation could assure to man the reality of external things. Man's permanent possession of the divine thought depends, in a measure, on himself: he may consent to and obey it, and thus secure it; or may rebel against it, and thus lose it. It is by participation of it that individuals possess a moral personality; it is the vital principle the entire withdrawal of which would result in annihilation.' The final hope of man and of the world is in God. 'The Being who creates existences also redeems them.' Among Gioberti's more popular works *The Moral and Civil Supremacy of the Italians,* and *The Modern Jesuit,* (8 vols. Lausanne 1847), produced great effect, and though perfectly 'orthodox' doubtless hastened the transfer of power from clerical to civil hands. Jesuit influence however succeded in placing these books in the *Index;* yet they continue to be read by the people.

GIOBER'TINE TINCT'URE: see PALIMPSEST.

GIOCONDO, *jo-kon'do,* or JOCUNDUS (FRA GIOVANNI): 1450–1530; b. Verona, Italy: architect. He was educated for the priesthood, became a Dominican friar, studied archeology and architecture in Rome, planned the fortifications of Treviso, was architect to the emperor Maximilian at Verona and built the council palace and the church of Sta Maria della Scala 1494–98, and entered the service of Louis XII. of France 1500. During the next seven years he was occupied in building the bridges of Notre Dame and the Hotel Dieu, in Paris. After constructing the Fondaco de

Tedeschi, on the Venetian Rialto, he was appointed by the pope architect of St. Peter's, in Rome 1514, where he labored cotemporaneously with Raphael. He was thoroughly versed in philosophy, theology, and Greek and Latin literature.

GIOJA, *jo'yâ*, DEL COLLE: town of s. Italy, province of Bari, 26 m. s. of Bari. It is a thriving industrious place, surrounded by a fine fertile territory; formerly famous for the beauty of its woods, favorite hunting-grounds of Emperor Frederic II. Pop. 20,000.

GIOJA, *jō'yâ*, FLAVIO, Italian mariner: b. Pasitano, near Amalfi, in the latter part of the 13th century. He is said to be the inventor of the mariner's compass, of which he made use in 1302–3. The tendency of the loadstone to turn toward the north was known before his day, but the compass then in use consisted only of a magnetized reed floating upon cork in a vessel of water. Gioja invented the plan of suspending it on a pivot, thus leaving it free to move in any direction, whereby observations were rendered both easier and more exact.

GIO'JA, MELCHIORRE: 1767, Sep. 20—1829, Jan. 2; b. Piacenza: Italian statistician. He was educated for the priesthood, and was for a time tutor in a noble family, but through the liberality of his brother was enabled to follow his own bent toward social and economic science. When the invading forces of France descended into Italy, Gioja had already attracted much notice by his political writings; and 1797 he quitted Piacenza for Milan, and was appointed state historiographer, of which post he was deprived 1803, through dissatisfaction with his work on divorce. In 1806, he was appointed director of the statistical dept., and 1809 was charged with the preparation of a grand statistical report of all Italy. A change of government interrupted this great labor. Gioja died at Milan. His laborious habits and immense knowledge enabled him to accomplish an incredible amount of labor; but he showed weakness in resenting with bitter personal invective the least unfavorable criticism of his works. Some of his chief works are: *Sul Commercio de' Commestibili e caro prezzo del vitto* (Milan 1802, 2 vols. 12mo); *Teoria civile e penale del divorzio ossia necessità, cause nuova maniera di organizzarla* (Milan 1803, 8vo); *Nuovo prospetto delle scienze economiche, ossia somma totale delle idea teoriche e pratiche in ogni ramo d'amministrazione privata e pubblica* (Milan 1815–19, 6 vols. 4to); *Filosofia della Statistica* (Milan 1826, 2 vols. 4to); *Dell' ingiuria, dei danni, del soddisfaci mento e relative basi di stima* (Milan 1802, 2 vols. 8vo).

GIOJOSA, *jō-yō'sâ:* town of s. Italy, province of Reggio; about 7 m. n.e. of Gerace, in a fertile and beautiful district. It is supposed to have risen on the ruins of the anc. city of Mitra, mentioned by Pliny. Its air is remarkable for purity, and its inhabitants for physical vigor and beauty Pop. 8,000.

GIORDANO, *jor-dâ′nō*, Luca: Italian painter: abt. 1632–1705, Jan. 12; b. Naples, of impoverished parents. He studied under Ribrera or Spagnoletto. He had fine imagination and delicate touch, yet both his early productions and those of his mature years, indicate a power of beautifully correct imitation rather than any marked originality or genius. Giordano went to Rome, then to Lombardy and Venice, to familiarize himself with the schools of art. In 1692 he went to Madrid at the request of Charles II., King of Spain, who desired his assistance in the embellishment of the Escorial. His pleasing manner and genial humor made him a special favorite at the Spanish court. At the death of the king, ten years later, he returned to Italy. His extreme rapidity of execution, for which Giordano was remarkable, enabled him to produce a prodigious number of works, but lowered their quality; they possess, however, many beauties, such as animation, harmonious freedom of treatment, boldness and perfection of foreshortening. The palaces Riccardi and Pitti contain fine specimens of this artist's style, but his best paintings are in the galleries of Dresden and Naples, and the Escorial at Madrid. The name *Fa presto*, which distinguished him through life, referred to his father's incessant injunctions to *work quickly*, in order that the proceeds of his labor might relieve the indigence of the family.

GIORGIONE, *jor-jō′nā*, or Giorgio Barbarelli, *jor′jō bâr-bâ-rĕl′lē:* abt. 1478–1511; b. Castelfranco, in the Venetian territory of Trevisano: one of the most poetical and fascinating of Italian painters. He studied under Giovanni Bellini, but quickly surpassed his master; for while Bellini's style is distinguished for its minute finish and cramped precision, that of Giorgione revels in freedom and breadth of outline, and gorgeous depth of color. Unfortunately for art, Giorgione died at the early age of 33. His few works are among the most rare and exquisite examples of the Venetian school. Scriptural scenes, highly original in idea and treatment, portraits, and a few sweet idyllic scenes, representing pastoral concerts and sylvan enjoyments, are his subjects. The Lombard galleries and the Louvre possess the best authenticated originals of Giorgione, whose imitators were numerous.

GIOTTO, *jŏt′to*, or Ambrogiotto Bordone, *âm-brō-jŏt′-tō bor-dō′nā:* great Italian painter, architect, and sculptor: 1276–1336; son of a poor shepherd. He passed his earliest years in watching flocks in his native Tuscan valley of Vespignano. Here he first essayed to reproduce on a fragment of slate the forms of nature surrounding him, foreshowing his later achievements in depicting nature in her purest and most winning aspects. One of these simple pictures of sheep having fallen under the notice of Cimabue was the occasion of Giotto's being received into Cimabue's studio. Giotto's intuitive perception of the *true* in art speedily emancipated him from the conventionalities, though Cimabue himself had previously moved in this direction. I-

Giotto's paintings, however, we first markedly observe instead of the flat elongated forms and lifeless features of the Byzantine types, figures imbued with the varied action and expression of nature, and exhibiting an ideal elevation and grandeur of character. He first also practiced the art of grouping with due regard to the sentiment and action of the composition, and gave simplicity and grace to the draping outline; in short, he effected a profound reformation in the style of art, which from his era assumed its rightful alliance with the beautiful in nature. The restorer of portraiture, his pencil has transmitted to our day the features and personality of his cherished Dante, of Brunetto Latini, Corso Donati, and other celebrities; and in return we find his name enshrined with reverence in all the grand literary works of the times, especially in those of Dante, Boccaccio, and Petrarca. His earliest extant works are mural paintings in the Church of St. Francis at Assisi, executed before the end of the 13th century. He was now called to Rome, and after painting various works there he went to Padua, in 1303, and adorned the chapel of the Annunciata dell' Arena with a series of famous frescoes, including 38 subjects, disposed in three rows, on the sides of the chapel and the front of the chancel wall, with a vast representation of the *Last Judgment* filling the west end. Dante was his guest at Padua in 1306, and he is celebrated in the great poet's *Divina Commedia*. He was also a friend of Petrarch. He worked also at Milan, Verona, Ravenna, Rimini, and Arezzo. In 1330–33 he was at Naples, and in 1334 was appointed master of the cathedral works and other undertakings at Florence, where he disigned the celebrated Campanile, a structure finished by his scholar and godson, Taddeo Gaddi. The works of this illustrious man are too numerous to be recorded here: some of the principal are *The Coronation of the Virgin*, in the church of Santa Croce at Florence; *A Last Supper*, in the refectory; the famous mosaic, executed at Rome for Pope Boniface VIII., named *La Navicella*, and representing Peter walking on the waves, a wonderful work, which has unhappily suffered severely in the successive repairs that it has required; the frescoes of the *Seven Sacraments*, painted at Naples in the church of the Incoronata, one of the most perfect of his works in point of preservation; and the frescoes of *Assisi*, illustrating the life of St. Francis, and innumerable other minor works. Giotto died at Florence, and was interred in the church of Santa Maria del Fiore, where a marble monument was erected to his honor by Lorenzo de' Medici.

GIOVENAZZO, *jō-vā-nât'sō:* thriving town in s. Italy, province of Bari, on the shore of the Adriatic, 14 m. w.n.w. of the town of Bari. It is considered the Natiolum of the Romans, and possesses some remains of its ancient walls. In the 11th c. it belonged to the Greeks, and eventually passed into the possession of the Gonzaga family. Here is an excellently organized asylum for the poor, with extensive juvenile reformatories.

GIPSIES: see GYPSY.

GIPSIRE, n. *jĭp'sīr* [F. *gibecière;* OF. *gibecer,* a game-pouch—from mid. L. *gibăcērĭă,* a large pouch]: in *OE.,* a game-bag; a purse or pouch formerly worn at the girdle.

GIRAFFE, n. *jĭ-răf'* or *zhĭ-răf',* or CAMELOPARD [F. *giraffe*—from Sp. *girafa*—from Ar. *zirâf,* or *zirâfah,* a giraffe], (*Camelopardalis Giraffa*): tallest of quadrupeds, ranked by some naturalists among deer (*Cervidæ*), but properly regarded as a distinct family of ruminants, which contains, however, only one species. It is a native of Africa, from Nubia to the Cape of Good Hope, extensively diffused, but apparently nowhere abundant. It occurs generally in small herds of 5-40. It feeds on the leaves and small branches of trees. Its general aspect is remarkable from the height of the foreparts and great elongation of the neck, the head being sometimes 18 ft. from the ground. The number of vertebræ in the neck, however, is not greater than in other quadrupeds, and it has no extraordinary flexibility, though its form and movements are very graceful. The body is short, and the back slopes from the shoulder to the tail; but the greater height of the foreparts is not owing, as often alleged, to the greater length of the fore-legs, which are not really longer than the hind-legs, but to processes of the vertebræ, which form a basis for the muscular support of the neck and head. The articulation of the skull to the neck is such that the head can be easily thrown back until it is in the same line with the neck, thus giving the animal additional power of reaching its appropriate food. The skull has empty cavities, which give lightness to the head, with sufficient extent of surface for the insertion of the ligament which supports it. The legs are long and slender; the feet have cloven hoofs, but are des-

Giraffe.

titute of the small lateral toes or spurious hoofs of the other cloven-footed ruminants. The head is long; the upper lip entire, projecting far beyond the nostrils, and

endowed with considerable muscular power. The tongue is remarkably capable of elongation, and is an organ of touch and of prehension, like the trunk of an elephant; it can be thrust far out of the mouth, and employed to grasp and take up even very small objects; it is said that its tip can be so tapered as to enter the ring of a very small key. The usefulness of such an organ for drawing in leaves and branchlets to the mouth is obvious. The G. adroitly picks off the leaves of acacias and other thorny plants, without taking the thorns into its mouth. The dentition of the G. agrees with that of antelopes, sheep, goats, and oxen; the upper jaw of the male is destitute of the canine teeth which are present in the male of most kinds of deer. The head is furnished with two remarkable protuberances between the ears, generally described as horns, but very different from the horns of other animals, and each consisting of a bone united to the skull by an obvious suture, permanent, covered with skin and hair, and terminated by long hard bristles. There is also a projection on the forehead. The ears are moderately long; the tail is long, and terminates in a tuft of long hair that nearly reaches the ground. There is a callosity on the breast. The neck has a very short mane. The hair is short and smooth; the color is a reddish white, marked by numerous dark rusty spots. The eye of the G. is very large and lustrous, and so placed that the animal can look all around without turning its head, so that in a wild state it is not easily approached. Its nostrils have a muscle by which they can be closed; a provision, as Owen supposes, for excluding particles of sand. It is an inoffensive animal, and generally seeks safety, if possible, in flight, though it is capable of making a stout resistance, and is said to beat off the lion. It fights by kicking with its hind-legs, discharging a storm of kicks with extraordinary rapidity. It is not easily overtaken even by a fleet horse, and has greatly the advantage of a horse on uneven and broken ground. Its pace is described as an amble, the legs of the same side moving at the same time. The G. was known to the ancients, and was exhibited in Roman spectacles. Representation of it appear among Egyptian antiquities. It has been supposed to be the *zemer* of the Jews, translated *chamois* in the English Bible (Deut. xiv. 5). In 1836, giraffes were added to the collection in the Zoological Gardens of London, and interesting opportunities of studying their habits have since been enjoyed. They are fed chiefly on hay placed in high racks, greatly enjoy carrots and onions, and a lump of sugar is a favorite delicacy. They have bred in England. The flesh of the G. is said to be pleasant, and its narrow is a favorite African delicacy.

GIRALDUS CAMBRENSIS, *jĭ-răl'dŭs kăm-brĕn'sĭs* (literary name of Girald de Barri): abt. 1146—abt. 1219; fourth son of William de Barri, a Norman noble who had settled in Pembrokeshire and allied himself by marriage to the family Rhys ap Theodor, prince of S. Wales. G. was educated by his uncle David, Bp. of St. David's; entered the Univ. of Paris in his 20th year, and after three years of lit-

erary distinction returned to England, entered into holy orders 1172, and was soon appointed Archdeacon of St. David's. He was from the first a zealous churchman; strenuous in the enforcement of discipline, especially as to clerical celibacy; and was the chief agent in the establishment of the payment of tithes within the principality. On the death of his uncle, the chapter of St. David's elected him bishop; but as the election was made without the royal license, G. renounced it. The king, Henry II., directed a new election; and on the chapter's persisting in their choice of G., the king refused to confirm the selection, and another bishop, Peter de Leia, was appointed. G. withdrew to his old residence in the Univ. of Paris, and on his return was required, by the Abp. of Canterbury, to take the administration of the diocese of St. David's, which had utterly failed in the hands of De Leia. He held it four years, when being appointed a royal chaplain, and afterward preceptor to Prince John, he accompanied that prince 1185 in his expedition to Ireland, where he remained after John's return, to complete the well-known descriptive account of that country, which, though very valuable as a whole, has in its details called forth angry criticism from Irish scholars and antiquaries. On his return 1187, he read this work publicly in the Univ. of Oxford, giving a full day to each of the three divisions of which it consists. A tour of Wales (1188) in the company of Baldwin, Abp. of Canterbury, lead to a similar descriptive work, *Itinerarium Cambriæ.* In the following year he accompanied the king to France, where he remained till the king's death. His later years, after his return, were full of disappointment. On the see of St. David's again becoming vacant, he was again unanimously elected by the chapters; but the Abp. of Canterbury having interposed, G., nothwithstanding an appeal to Rome, in prosecuting which he made three different journeys in five years of the contest, failed to obtain a confirmation of the nomination. He soon resigned his archdeaconry, and devoted the remaining 17 years of his life to study. Once again the see of St. David's became vacant, but though it was offered to G. on certain conditions, he declined to accept it. He died at St. David's in the 74th year of his age. The reason why G.'s appointment to the bishopric was so much opposed is not clear, but the king, it is said, had resolved that no native of Wales should obtain the dignity. G.'s writings, though disfigured by credulity, and, in the personal narratives with which they abound, by excessive vanity, are of great value as materials for the history and the social condition of the age and the countries which he describes. But they must be read with careful critical consideration of the sources of the information which they embody. Several of his works are still preserved in manuscript in the British Museum, the Bodleian, the Lambeth, and Corpus Christi College Libraries. His printed works are *Itinerarium Cambriæ; Topographiæ Hiberniæ; Expugnatio Hiberniæ; Descriptio Cambriæ;* and several smaller pieces, printed in Vol. II. of Wharton's *Anglia Sacra,*

Barri's work on Ireland called forth several rejoinders, the most valuable of which is that of John Lynch (under the pseudonym *Gratianus Lucius*), entitled *Cambrensis Eversus.* Sir Richard Colt Hoare translated *Itinerarium* (2 vols. 1806); and his complete works have been edited by J. S. Brewer and J. F. Dimock (7 vols., Rolls series 1861–77.

GIRANDOLE, n. *jĭr'ăn-dōl* or *zhĭr'ăn-dōl* [It. *girandola* —from L. *gyrārĕ*, to turn round in a circle]: a large kind of branched candlestick; a candelabrum.

GIRARD, *zhē-râr'*, Philippe Henri de: 1775, Feb. 1—1845, Aug. 26; b. near Avignon, France: inventor. At the beginning of the Revolution he accompanied his family to Italy, supported himself by painting some time, established a soap factory at Leghorn 1793, and after the fall of Robespierre returned to France and opened a chemical factory at Marseilles. Soon afterward he became prof. of chemistry and natural history at Nice. In 1800 he returned to Marseilles, and went thence to Paris, where with his brother Frederick he began manufacturing soap. In 1804 the brothers took out a patent for the 'fountain' lamp, and 1806 he received a gold medal for his invention of a one-cylinder direct-acting steam-engine. In 1810 he began experiments to produce a machine for spinning flax for which Napoleon had decreed a reward of 1,000,000 fr.; succeeded in his attempts, and started factories in Paris and Charonne, where he used his invention 1813. The fall of the emperor 1815 deprived him of the decreed reward, but he was officially declared to have earned it. Failing to secure the reward with which he expected to pay the expenses of his experiments, he was obliged for financial reasons to leave France. He went first to Austria where he established a flax-mill at Hirtenberg and built the first line of steamships on the Danube, then 1825 to Poland, on the invitation of the emperor of Russia, where he built another flax factory and became chief engineer of the mines, and 1844 returned to Paris. Among his exhibits at the exposition of that year were a machine for combing flax, a machine for making gun-locks, several improvements in guns, a double-octave piano, and a new instrument called the *tremolophone.* He received a gold medal for his various flax-treating inventions, a pension from the Russian govt. for services in Poland, and shortly before his death a further pension from the Soc. of Inventions.

GIRARD, *jē-rârd'*, Stephen: 1750, May 24—1831, Dec. 26; b. near Bordeaux, France: philanthropist. He was brought up a sailor, became capt. of a vessel, engaged in the American coasting and West India trade, and settled in Philadelphia 1769, where he carried on the shipping and mercantile business till the revolutionary war, and then established himself as a grocer, sutler, and liquor dealer. 1780–90 he was again in the W. India trade, became custodian of a large amount of money and valuables belonging to Haytian planters during the insurrection 1791–1804, and which was never called for, invested largely in Philadelphia real-estate and the shares of the old Bank

of the United States, and 1812 bought the bank building and conducted the business in his own name. In 1814 he loaned the govt. $5,000,000, 1816 became a director of the second U. S. Bank, and at the time of his death was counted the richest man in the United States, possessing property worth $9,000,000. He organized a yellow-fever hospital during the great epidemic 1793, and acted as head-nurse during its continuance. He gave large sums to local charities for local improvements and churches though despising Christianity, but would not answer appeals for aid from any source. In his will he bequeathed $30,000 to the Penn. Hospital, $20,000 to the Penn. Institution for the Deaf and Dumb, $10,000 to the Philadelphia Orphan Asylum, $10,000 to the Philadelphia public schools, $10,000 to the city to provide fuel for the poor every winter, $10,000 to the Soc. for the Relief of Distressed Shipmasters, $20,000 for Masonic uses, $500,000 to the city of Philadelphia for street improvements and public buildings, $300,000 to the State of Penn. for the improvement of its canal navigation, a large amount of real-estate to the city of New Orleans, and $2,000,000, a plot of ground in Philadelphia, and the residue of one portion of his estate for the erection and support of an orphans' college. His will further provided that no minister or ecclesiastic of any church or sect should ever be connected with the college or even permitted to visit it. See GIRARD COLLEGE.

GIRARD′ COLLEGE: in Philadelphia, founded by Stephen Girard (q.v.) for the benefit of poor white male orphans, and built and managed according to the founder's instructions in his will. The grounds have an area of 41 acres, are surrounded by a stone wall 10 ft. high, and contain a main building and five subordinate ones. The college proper is in the form of a Corinthian temple, 169 ft. long, 111 ft. wide, 97 ft. high, with outer walls, staircases, floors and roof of white marble and inner walls of brick, and with a portico of 34 columns, each 55 ft. high and 6 ft. in diameter. The founder died 1831, Dec. 26, the buildings were begun 1833, July, and opened 1848, Jan. 1. Two of the subordinate buildings, also of marble, stand on each side the main structure, and the fifth, near by, is used for laundry, bakery, and laboratory purposes. The buildings cost between $1,900,000 and $2,000,000, and the value of the college property exceeds $16,000,000. The college has a library of nearly 20,000 volumes, 70 professors and a student body of about 1,800. The total number of graduates exceeds 5,000.

GIRARDIN, *zhē-rȧr-dăng′*, EMILE DE: French journalist and politician: 1802–1881, Apr. 27; b. in Switzerland; illegitimate son of the royalist gen. Alexandre de Girardin and Madame Dupuy. He was educated in Paris, and 1823 was appointed gen.sec. of the royal museums. After the July revolution, Girardin established the *Journal des Connaissances utiles*, for which he secured 120,000 subscribers; in 1832, the *Musée des Familles;* and in 1834, the *Almanach*

de France. He published also *Atlas de France* and *Atlas Universel.* These publications were set forth as emanating from a *Société Nationale pour l'émancipation intellectuelle,* and had considerable influence on the progress of public instruction in France. In 1836 he founded the *Presse,* as an organ of political conservatism, and soon found himself in violent controversies: one result of these was his duel with Armand Carrel, editor of the *National,* in which the latter fell. From this time till the revolution of 1848, he was ardently occupied with politics both as journalist and deputy; and from being a defender of Guizot and moderate liberalism, he became a decided republican.

Girardin was the first to propose Louis Napoleon as a candidate for the presidentship, but only four weeks after the triumph of Louis Napoleon, he opposed him with the greatest virulence—the reason generally given, being the president's disagreement with the political scheme which Girardin submitted to him. Girardin then threw himself into the arms of the socialists. In 1856 he sold his share of the *Presse,* but became ed. of it 1862, eventually abandoning it for the direction of *La Liberté,* which he continued till 1870. In 1874 he became ed. of the *Journal La France.* He wrote a few pieces for the stage; his political ideas he gave to the world in a host of brochures.—Madam E. de Girardin (1804–55), wife of Emile de Girardin (maiden name, Delphine Gay) had brilliant reputation as poetess, novelist, and play-writer. Her best known work is *Lettres Parisiennes,* in her husband's periodical *La Presse,* under the pseudonym Le Vicomte de Launay.

GIRARDIN′, St. Marc (real name Marc Girardin): 1801–73, Apr. 11; b. Paris: French journalist and professor. He studied at the College Napoléon and the College Henri IV., and 1827 obtained a professorship in the College Louis-le-Grand. Afterward he was appointed to succeed Guizot as prof. of history in the Faculty of Letters, was named master of requests to the council of state, and 1834 was called to the chair of poetry at the Sorbonne. About the same time he was elected to the chamber of deputies, and acquired a reputation by his report on the organization of secondary instruction 1837. In 1844 he was received into the Académie. Girardin took no special part in the revolution of 1848. In 1863 he resigned his professorial chair. His great influence and popularity as a lecturer, were due to his clearness, good sense and humor. He became a member of the national assembly 1871, and was more than once elected its vice-pres. Besides his numerous contributions to the *Débats,* which he partly edited from 1827, and to the *Revue des Deux Mondes,* he published several large works, among which are *Notices Politiques et Littéraires sur l'Allemagne* (1834); *Cours de Littérature Dramatique* (1843); and *Tableau de la Littérature au 16e Siècle, suivi d'Etudes sur la Littérature du Moyen Age et de la Renaissance* (1862).

GIRARDON, *zhē-râr-dōng′*, François: 1628, Mar. 16—1715; b. Troyes, France: sculptor. He was apprenticed

when a boy to a joiner and wood-carver in his native town, and while working at the château of Liebault attracted the attention of Chancellor Seguier, by whom he was aided to study in Paris and Rome. He returned to France 1650, began working under Le Brun, the gen. inspector of sculpture, and was subsequently given large commissions by the king for groups and statues in several royal palaces and gardens. In 1650 he became a member of the Acad., and 1690 successor to Le Brun. He executed four figures for the Bains d'Apollon; a bronze equestrian statue of Louis XIV. erected by the city of Paris on the Place Louis le Grand, and melted down during the Revolution; the tomb of Richelieu in the Church of the Sorbonne; the tombs of St. Eustache and St. Nicolas du Chardonneret; and decorative sculptures in the Galérie d'Apollon and Chambre du Roi, in the Louvre.

GIRASOL, or GIRASOLE, *jĭr'a-sōl* [It. *girasole*—fr. L. *gyro*, I turn round in a circle; *sol*, sun]: precious stone, exhibiting in strong lights a peculiar and beautiful reflection of bright red or yellow light, which seems to come from the interior. There are different kinds of Girasol, variously referred by mineralogists to quartz and opal, though very nearly allied. One kind is known as *Fire Opal*, found only at Zimapan, in Mexico, and in the Faroe Islands. The Mexican specimens are of a rich topaz-yellow color, and the reflection is very bright. Another kind is the *Quartz Resinite* of Haüy, so called because of its characteristic resinous fracture. It is of various colors sometimes of a fine yellow or emerald green, but generally bluish white. For a specimen of extraordinary brilliancy, not an inch and a half in diameter, $5,000 has been refused. The ancients held this stone in high estimation. They called it *Asteria* [Gr. *aster*, a star]. They obtained it from Caramania and from India: the Caramanian were preferred. The brightest are at present brought from Brazil, but fine specimens are brought also from Siberia. Imitation girasols are made of glass, in which a little oxide of tin is mixed.—The name girasol is sometimes given to a kind of sapphire, called also *Asteria sapphire*, exhibiting a similar reflection of light; and sometimes to *Sunstone*, an avanturine felspar.

GIRASOLE, or GIRASOL, n. *zhĭr'ă-sŏl* [It. *girasole*—from L. *gyro*, I turn round in a circle; *sol*, sun]: plant called turn-sole; the Jerusalem-artichoke or sunflower.

GIRD, v. *gėrd* [Icel. *gardr*, a fence or hedge; *girda*, to inclose or surround with a fence: Goth. *gairda*, a girdle: L. *gyrārĕ*, to turn]: to bind round; to surround with a flexible substance, as a bandage, twig, or cord; to invest; to encircle: N. in *Scot.*, a hoop. GIRD'ING, imp. GIRD'ED, pp., or GIRT, *gėrt*. GIRDER, n. *gėr'der*, that which binds, ties, or encircles; in *arch.*, a principal beam in a floor for supporting the binding or other joists, used also for supporting the roadway of a bridge (see below). GIRDLE, n. *gėrdl* [Icel. *gyrdill;* Sw. *gördel*]: a band or belt for the

waist; a zone (see below); in *Scot.*, a round iron plate on which bread is baked: V. to surround; to bind; to inclose. GIR'DLING, imp. GIR'DLED, pp. *-dld.*

GIRD, n. *gėrd*, or GIRR, n. *gėr:* in *Scot.*, a hoop: see GIRD 1.

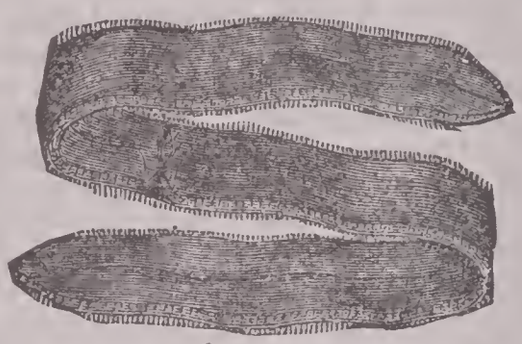
GIRD, v. *gėrd* [Ger. *gerte;* Dut. *gard*, a rod, as for chastising: Bav. *garten*, switches]: in *OE.*, to lash with sneers or reproaches; to sneer at: N. a sharp retort; a sarcasm. GIRD'ING, imp. GIRD'ED, pp.: see GRIDE.

GIRD'ER: a main beam used to support joisting walls, arches, etc. Girders may be of wood or iron, and are now usually of cast-iron. They are used as temporary support for upper walls of houses, while the lower part is cut a way to allow of rearrangement. Wooden girders strengthened with iron trusses are called trussed girders. Sometimes a beam is cut in two, and an iron plate inserted between the pieces, and the whole bolted together: this girder is called a sandwich beam. Girders are much used in railway works, generally of wrought iron; the Menai and Britannia Bridges are simply very large boxed girders. The *lattice girder* is a form in which the sides are made somewhat like wooden lattice-work. See STRENGTH OF MATERIALS.

GIRDLE, n. *gėr'dl:* see under GIRD 1.

GIRDLE, *gėr'dl:* strip or band of various materials, plain or ornamented according to the fancy of the wearer, used around the waist to gather in the loose and often flowing outer robes, or to fasten and support other garments. The Romans used it to confine the tunic, and no one of good repute would be seen without one; Greek and Roman Soldiers were never without it while in service, and when they laid it aside the act denoted their retirement from military life; and from remote days it has been a common article of dress in s. Europe and in all eastern countries. At various periods it was customary to carry the purse, dagger, rosary, pen and inkhorn, and bunch of keys, suspended from it. Bankrupts acknowledged their condition by removing and surrendering their girdles in open court, and widows renounced various rights by placing their girdles on their husbands' graves or tombs. In time great extravagance in girdles and girdle-buckles prevailed. From the 12th to the 16th c. the favorite style as shown on brasses and monumental effigies, was a girdle of leather or woven silk, adorned with gold and costly gems, and fastened with a buckle of some precious metal inlaid with gems. Edward III. prohibited the wearing of gold and silver girdles except by persons of knightly rank or those with £200 a year. The girdle was an important feature of the dress of the Levitical priesthood, but does not appear as an ecclesiastical vestment in the Christian church till the 8th c., and a few centuries afterward it was denounced there as unbecoming, and fostering extravagance.

GIRD'LE OF VE'NUS (*Cestum Veneris*): very remarkable animal, one of the *Acalephæ* (q.v.), inhabiting the Mediterranean, gelatinous, of ribbon-like shape, sometimes five or six ft. in apparent length, by about two inches in breadth; though considered with reference to the structure of the animal, the apparent length is really its breadth, and the apparent breadth its length. The mouth is in the middle of the inferior edge, and the stomach is imbedded in the gelatinous substance. The edges are fringed with cilia, by the movements of which the creature seems to be propelled in the water. It exhibits lovely iridescent colors



Girdle of Venus (*Cestum Veneris*).

by day, and beautiful phosphorescence by night. Its substance is so delicate, that there is difficulty in obtaining a perfect specimen.

GIRGEH, *jĭr'jė*, or GIRGA, or JIRJEH: town of Egypt, on the left bank of the Nile, lat, 26° 20′ n., and long. 31° 58′ e. Here the discontented Mamelukes rallied against Mohammed Ali. It contains eight mosques, a large bazaar, and a cotton manufactory. Girgeh is cap. of a dist. with pop. 550,000. The town has a convent of Rom. Cath. missionaries, and there are abt. 800 Christians in its total pop. of 10,000.

GIRGEN'TI: see AGRIGENTUM.

GIRL, n. *gėrl* [Low Ger. *göre*, a child: prov. Ger. *görr*, a girl: Swiss, *gurrli*, a depreciatory term for a girl]: *formerly*, a youth of either sex; a female child; a young woman; in *the chase*, the young of the roe in its second year. GIRL'HOOD, n. the state of a girl. GIRL'ISH, a. *-ĭsh*, like a young woman or child; youthful. GIRL'ISHLY, ad. *-lĭ*. GIRL'ISHNESS, n. the manners of a girl.

GIRN, v. *gėrn* [see GRIN]: in *Scot.* and *OE.*, to whine and cry from ill-humor or fretfulness; to snarl; to grin; to gape: N. a crying from fretfulness; a grin. GIR'NING, imp. GIRNED, pp. *gėrnd*.

GIRNAL, n. *gėr'năl*, or GARNELL, n. *gâr'nĕl* [F. *grenier;* OF. *grainier*. a granary]: in *Scot.*, a granary; a large chest for holding meal.

GIRNAR, *gėr'nar:* sacred mountain in India, of most remarkable aspect, in the peninsula of Kattywar (part of the native state of Guzerat), lat. 21° 30′ n., and long. 70° 42′ e. Above the mass of luxuriant hills and valleys which

surround its base, rises a bare and black rock of granite about 3,000 ft. above the sea. The summit is broken into various peaks, its n. and s. sides being nearly perpendicular. An immense boulder, which seems poised on one of the scarped pinnacles, is called the Beiru Jhap, or Leap of Death, from its use by devotees for the purpose of self-destruction.

GIRODET DE ROUSSY, *zhe-ro-dā′ dė rô-se′*, ANNE LOUIS (known as GIRODET-TRIOSON): 1767, Jan. 5—1824, Dec. 9; b. Montargis, France: painter. On the death of his parents he was educated and adopted by his guardian, whose name, Trioson, he added to his own. He studied painting in Paris with David, secured the Prix de Rome when 22 years old, spent 5 years in Italy, and settled in Paris 1795. While studying in Rome he painted and sent to Paris *Hippocrates Refusing the Gifts of Artaxerxes* and the *Sleeping Endymion*, which attracted special notice in the Salon of 1792, and on his return painted portraits of Chateaubriand and Hortense. *The Four Seasons* and *Danae* for the king of Spain; *Fingal, Ossian, and their Descendants welcoming to their Aerial Palace the Manes of French Heroes*, for Napoleon I. (1802); and the *Scene of the Deluge*, which was awarded the decennial prize in competition with David's *Sabines* at the Salon of 1806. The last, considered his greatest work, was followed by the *Reddition de Vienne* and *Atala au Tombeau* (1808); *Revolte de Caire* (1810); a *Tête de Vierge* (1812); *Pygmalion et Galatée* (1819); and portraits of Cathelineau and Bonchamps (1824).

GIRONDE, *jē-rŏnd′*, F. *zhē-rōngd′:* maritime dept. in s.w. France; formed out of part of the old province of Guienne; bounded w. by the Bay of Biscay, on the n. by the dept. of Charente-Inférieure, on the e. by those of Dordogne and Lot-et-Garonne, and on the s. by that of Landes; 3,750 sq. m. It is watered mainly by the Garonne and the Dordogne, and by the Gironde, formed by the union of these two rivers. The surface of the land is in general flat, but in the e. are some hills. The climate is temperate, and except in the Landes or sandy tracts, which occupy nearly all the w. half of the dept., is healthful. In the e. and n.e. the soil is chiefly calcareous. Wine, including the finest clarets, is the great product. The principal growths are those of Lafitte, Latour, Château-Margaux, Haut-Brion, Sauterne, Barsac, St. Christophe, and the Vins de Graves, and the quantity produced annually averages 50,000,000 gallons. Grain, vegetables, fruit, and hemp, are produced largely. On the w. coast, on the downs or sand-hills, are extensive plantations of pine, from which turpentine, pitch, and charcoal are obtained. The shepherds of the Landes traverse the sands on high stilts, and travel with stilts also to markets and fairs. Among the manufactures salt, calico, muslin, chemical products, pottery, paper, vinegar, and brandy are chief. Bordeaux is the cap. Pop. of dept. about 850,000.

GIRONDIST, n. *jĭ-rŏn′dĭst* [Fr. *Girondin*, fr. the dept.

of Gironde]: one belonging to the moderate republican political party during the French Revolution. When the legislative assembly met 1791, Oct. the Gironde dept. chose for its representatives the advocates Vergniaud, Guadet, Gensonné, Grangeneuve, and a young merchant named Ducos, all of whom soon acquired great influence by their rhetorical talents, and by their political principles derived from a hazy notion of Grecian republicanism. They were joined by Brissot's party and the adherents of Roland, as well as by several leaders of the centre, such as Condorcet, Fauchet, Lasource, Isnard, and Henri La Rivière, and for some time had a parliamentary majority. They directed their efforts first against the reactionary policy of the court, and the king saw himself compelled to select the more moderate of the party, Roland, Dumouriez, Clavière, and Servan, to be ministers. Ultimately, however, he dismissed them, which led to the insurrection 1792, June 20. The encroachments of the populace, and the rise of the Jacobin leaders, compelled the Girondists to assume a conservative attitude; but though their eloquence still prevailed in the assembly, their popularity and power out of doors were wholly gone, and they were unable to prevent such hideous crimes as the September massacres. The principal things which they *attempted* to do after this—for they never succeeded in accomplishing anything—were to procure the arrest of the leaders of the September massacres, Danton, etc.; to overawe the mob of Paris by a guard selected from all the depts. of France; to save the king's life by the absurdest of all possible means, viz., by first voting his death, and then by intending to appeal to the nation; and, finally, to impeach Marat, who, in turn, induced the various sections of Paris to demand their expulsion from the assembly and their arrest. This demand, backed by 170 pieces of artillery under the disposal of one Henriot, leader of the sans-culottes, could not be resisted; 30 of the Girondists were arrested on a motion of Couthon, but the majority had escaped to the provinces. In the depts. of Eure, Calvados, and all through Brittany, the people rose in their defense, and under the command of Gen. Wimpfen, formed the so-called 'federalist' army, which was to rescue the republic from the Parisian populace. Movements for the cause of the Girondists took place likewise at Lyon, Marseille, and Bordeaux. The progress of the insurrection was, however, stopped by the activity of the convention. On July 20, the revolutionary army took possession of Caen, the chief station of the insurgents, whereupon the deputies of the convention, at the head of the sans-culottes, forced their way into the other towns, and commenced a fearful retribution.

1793, Oct. 1, the prisoners were accused before the convention by Amar, as the mouthpiece of the committee of public safety, of conspiring against the republic with Louis XVI., the royalists, the Duke of Orleans, Lafayette, and Pitt, and it was decreed that they should be

brought before the revolutionary tribunal. On the 24th, their trial commenced. The accusers were such men as Chabot, Hébert, and Fabre d'Eglantine. The Girondists, however, defended themselves so effectually, that the convention on the 30th was obliged to come forward and decree the closing of the investigation. That very night, Brissot, Vergniaud, Gensonné, Ducos, Fonfrède, Lacaze, Lasource, Valazé, Sillery, Fauchet, Duperret, Carra, Lehardy, Duchâtel, Gardien, Boileau, Beauvais, Vigée, Duprat, Mainvielle, and Antiboul, were sentenced to death, and, with the exception of Valazé, who stabbed himself on hearing his sentence pronounced, all perished by the guillotine. On their way to the Place de Grève, in the true spirit of French republicanism, they sang the *Marseillaise*. Coustard, Manuel, Cussy, Noel, Kersaint, Rabaut, St. Etienne, Bernard, and Mazuyer, were afterward guillotined. Biroteau, Grangeneuve, Guadet, Salles, and Barbaroux ascended the scaffold at Bordeaux; Lidon and Chambon, at Brives; Valady, at Périgueux; Dechézeau, at Rochelle. Rebecqui drowned himself at Marseille, Pétion and Buzot stabbed themselvès, and Condorcet poisoned himself. Sixteen months later, after the fall of the Terrorists, the outlawed members, including the Girondists Lanjuinais, Defermon, Pontécoulant, Louvet, Isnard, and La Rivière, again appeared in the convention. A somewhat flattering picture of the party has been drawn by Lamartine, in *Histoire des Girondins* (8 vols. Paris 1847.)

GIRONNÉ, or GYRONNÉ, *jī-rŏn′nā*, or GYRONNY, *jī-rŏn′nĭ* [Lat. *gyrus*, a circle]: term in heraldry, indicating that the field (q.v.) is divided into six, eight, or more triangular portions, of different tinctures, the points of the triangles all meeting in the centre of the shield.

GIRT, *gėrt:* pt. or pp. of GIRD, which see.

GIRT, v. *gert* [from GIRD]: to gird; to surround. GIRT′ING, imp. GIRT′ED, or GIRT, pp.

GIRTH, n. *gėrth* [Icel. *gerd;* Dan. *giord*, a girth: AS. *gyrd;* Ger. *gurt*, a girth (see GIRD 1)]: the band or strap by which a saddle is made fast on a horse by passing it under his belly; the circumference or round measurement of timber, or of animals.

GIRTON COL′LEGE, *gėr′ton:* notable college for women in England, instituted at Hitchin 1869, removed to Girton, near Cambridge, 1873. Instruction is given in divinity, modern languages, classics, mathematics, moral science, natural science (including physiology and chemistry), history, music. There are ten lecturers, mostly connected with Cambridge University. The mistress and two resident lecturers are ladies. The students, who number above 150, are admitted after an entrance examination; the ordinary course extends over three years, half of each year being spent in college. 'Degree Certificates' are granted to those who satisfy their examiners as to their proficiency according to the standard of the examinations for the B.A. of Cambridge Univ.; the

'College Certificate' is granted for a somewhat different group of subjects.

GIRTY, *gėrtĭ*, SIMON, American frontiersman and leader of the Indians: b. present Dauphin County, Pa., 1741; d. Canada 1818. He became a second lieutenant of Virginia militia, later an Indian interpreter, deserted to the English in 1776, was appointed an interpreter to the English Indian department, and was declared a traitor by the Pennsylvania legislature. His name was popularly associated with many Indian atrocities on the frontier, although it is likely that he was not at any time commander of a large force and that his prestige among the savages was much less than was supposed. He did, however, lead the Indians who attacked Dunlap's station (1791) and Fort Jefferson (1791).

GISSING, *gĭs'sĭng*, GEORGE, English novelist; b. Wakefield 1857, Nov. 22; d. Saint Jean de Luz, France, 1903, Dec. 28. In his stories he has made a remarkable study of the London masses, from the ranks of skilled labor to the most noisome human refuse of the slums, the result being half repulsivė and wholly powerful. He has published: *The Unclassed* (1884); *Demos* (1886); *Isabel Clarendon* (1886); *Thyrza* (1887); *A Life's Morning* (1888); *The Nether World* (1889); *The Emancipated* (1890); *New Grub Street* (1891); *Born in Exile* (1892); *Denzil Quarrier* (1892); *The Odd Women* (1893); *In the Year of Jubilee* (1894); *Eve's Ransom* (1895); *The Whirlpool* (1897); *Human Odds and Ends* (1897); *The Town Traveler* (1898); *Charles Dickens, a Critical Essay* (1898); *The Crown of Life* (1899); *Our Friend the Charlatan; By the Ionian Sea* (1901.)

GIST, n. *jĭst* [OF. *giste*, a lying or lodging: F. *gîter*, to lodge: originally a lodging-place to a traveller for the night]: the main point of a question; that on which it rests or turns; point to arrive at: see GEST 2.

GITTERN, n. *gĭt'tėrn:* see CITHERN.

GITTITH, n. *gĭt'tĭth* [Heb.]: this word, which is found in the titles of Ps. viii., lxxxi., lxxxiv., is by some supposed to signify a musical instrument (perhaps as used at Gath); by others, a vintage-song, or well-known tune, to which the Psalm could be sung. Various other explanations have been offered. The form *Gitteth* is an error.

GIULINI, *jô-lē'nē*, GIORGIO: 1714–1780, Dec. 24; b. Milan; historian and antiquary. He studied law at the Univ. of Padua, and received the degree of doctor. After 20 years of patient labor, he published a valuable historical work, *Memoirs concerning the Government of Milan, with Description of the City and Mîlanese Territory from the Early Ages*, 4 vols., for the period from the destruction of the Lombard domination, to the opening of the 14th c. In three subsequent books, he descends to 1447. The work is considered by Giulini's countrymen a masterpiece of learning, impartiality and judgment: much of its

history is based on the evidence of coins, seals, documents, etc.

GIULIO ROMANO, *jô'lē-ō rō-mâ'nō* (real name GIULIO PIPPI, *jô'lē-ō pĭp'ē*): 1492–1546; b. Rome (whence his name Romano): one of Raphael's most distinguished and beloved pupils. His excellence as architect and engineer almost equalled his genius as painter. He assisted Raphael in the execution of several of his finest works, and by special desire of the great master, he was intrusted with the completion of all his unfinished designs after his death. He likewise inherited a great portion of Raphael's wealth. The works executed by Giulio Romano, in imitation of Raphael, reflect so wonderfully, not alone the style and character, but the sentiment and spirit of the original, that in many instances uncertainty has arisen as to the hand from which they came; but the more original creations of Giulio are deficient in the ideal grace of his master, and display rather breadth, power of treatment, and boldness of imagination, than poetical refinement or elevation. Unlike Raphael, the chief excellence of Giulio does not lie in his conception of the *divine* or Christian, but rather of the *classical* ideal.

The principal architectural works designed by Giulio were executed at Mantua, during his lengthened residence at the court of Duke Frederick Gonzaga. The drainage of the marshes surrounding Mantua, and the securing the city from the frequent inundations of the rivers Po and Mincio, attest his skill as engineer; while his genius as an architect found free scope in the restoration and adornment of many of the chief public edifices of Mantua, and especially in the erection of the splendid palace known as Il Palazzo del Te, which he also embellished with mythological frescoes, and a profusion of exquisite decorations. Many of Giulio's finest pictures passed into the possession of Charles I. of England, who purchased, 1629, the celebrated collection of the Dukes of Mantua. Several are now in the Hampton Court Gallery; but the finest of all, a *Nativity*, was sold to France, and now adorns the Louvre. The Naples gallery of Capi d'Opera possesses a Holy Family by Giulio, called the *Madonna della Gatta*, and considered the greatest of his pictures; it is strongly imbued with the spirit and influence of Raphael. The Loggia of Raphael, in the Vatican, also contains some fine frescoes executed by Giulio; and in the Palazzo Farnese there is a grand frieze attributed to him.

GIUNTA PISANO, *jôn'tâ pē-sâ'nō:* probably abt. 1180–abt. 1236; b. prob. in Pisa: earliest Italian painter whose name appears on any work now remaining. He painted on cloth sketched on wood and prepared with plaster; and his works are of a low grade in art.

GIURGEVO, *jôr-jā'vō* (Rumanian *Giurgiu*): town of Rumania, on the left bank of the Danube, directly opposite Rustchuk, 40 m. s.s.w. from Bucharest, of which town it is the port. It was originally the Genoese settlement of St-

George. It is the great landing-place for steamers in Wallachia. A bridge across a narrow channel connects Giurgevo with Slobodse, an island in the Danube, on which stands a fortified castle. Here the Turks defeated the Russians, 1854, July 7. Pop. 15,000.

GIUSTI, *jôs'tē*, GIUSEPPE: most celebrated and popular poet and satirist of modern Italy: 1809, May 12—1850, May 31; b. Pescia, in the vicinity of Florence; from prominent Tuscan family. Giusti was intended for the bar, and studied at the Univ. of Pisa, where he obtained his degree doctor of laws. In college, Giusti was not a great student. Quitting Pisa, Giusti was domiciled at Florence, and attempted poetry in lyrical compositions of the romantic school, evincing elevated and nervous thought; but he soon discovered that satire was his forte. Giusti is pre-eminent in all the requirements of a great lyrical satirist—terse, clear, and brilliant, he depicts, alternately with pathetic regret and mocking laugh, the decorous shams and conventional vices of his age. His impartiality gives keener sting to his denunciation. While scourging tyrants he does not flatter the people, whose champion he avowedly is. His writings exercised a positive political influence. When the functions of the press were ignored, and freedom of thought was treason, his flaming verses in manuscript were in general circulation in Italy, and powerfully assisted in preparing the revolutionary insurrection of 1848. Then, for the first time, he appended his name to a volume of verses on the events and aims of the times. All his compositions are short, rarely blemished with personalities, and written in the purest form of the popular Tuscan dialect. The elegant familiarity of idiom presents great difficulties to foreigners, and greater to the translator. Giusti's writings are not only Italian, but essentially Tuscan. The style often reaches an almost Dantesque sublimity. His most celebrated pieces are *Stivale*, or the History of a Boot (Italy), a humorous narration of all the misfits, ill-usage, and patching allotted to this down-trodden symbol of his country; *Gingillino*, a sarcasm, deemed his masterpiece, portraying the sycophant: *Il Re Travicello*, or King Log; *Il Brindisi di Girella*, or the Weathercock's Toast, dedicated to the suggestive name of Talleyrand; and the *Dies Iræ*, or Funeral Oration of Emperor Francis I. An authorized and correct edition of his works was pub. at Florence 1852 by Le Monnier: a good edition, with valuable annotations by Prof. Giovanni Fioretti, was pub. Vienna 1876. Mrs. T. A. Trollope's English translations, which are good, were pub. in the *Athenæum*.

GIUSTINIANI, *jôs-tē-nē-â'nē:* illustrious Italian family to which the republics of Venice and Genoa owed more than one doge. It was originally of Venice, but established itself in Genoa also, and had branches elsewhere. One of the palaces of Rome was erected toward the end of the 16th c. by a descendant of the family, Marquis Giustiniani.

The site that he selected was a portion of the ruins of Nero's baths, and he enriched the palace with a magnificent private gallery of paintings, and a fine collection of sculptures. He also formed a museum of antiquities. In 1807, the Giustiniani family conveyed the collection of paintings to Paris, where they disposed of the greater part by auction, and privately sold the remainder, consisting of 170 fine paintings, to the artist Bonnechose, who resold them to the king of Prussia. This fragment of the famous Giustiniani Gallery now enriches the Berlin Museum, and a very few of its former treasures are still in the Giustiniani palace at Rome.

GIUSTO, ad. *jûs'tō* [It.—from L. *justus*, just]: in *music*, in just or equal time.

GIVE, v. *gĭv* [AS. *gifan;* Icel. *gefa;* Goth. *giban*, to give: Dan. *give*, to give: Gael. *gabh*, to take, to lay hold of]: to bestow; to confer; to pay, as a price; to grant without price or reward; to impart; to grow moist; to soften; to resign or yield up; to render or utter; to yield to pressure or other force. GIV'ING, imp. GAVE, pt. *gāv*, did give. GIVEN, pp. *gĭv'n*, bestowed; conferred; addicted. GIV'ER, n. *-ėr*, one who. To GIVE AWAY, to confer on without an equivalent. To GIVE BACK, to return; to restore. To GIVE CHASE, to pursue. To GIVE EAR TO, to listen to. To GIVE FORTH, to publish; to tell; to send forth, as light. To GIVE IN, to yield. To GIVE OFF, to yield or produce from a surface, as vapor or a smell. To GIVE OUT, to report; to publish. To GIVE OVER, to cease; to addict; to attach to; to conclude lost; to abandon. To GIVE PLACE, to give way; to yield. To GIVE UP, to resign; to quit; to abandon; to deliver. To GIVE UP ONE'S SELF TO, to devote one's self to without restraint. To GIVE WAY, to yield; to make room for; to break. To GIVE IN TO, to adopt; to yield; to embrace.—SYN of 'give': to grant; yield; allow; deliver; pay; communicate; announce; pronounce; render; utter; permit; license; commission; produce; show; exhibit; devote; apply; move; recede.

GIZZARD, n. *gĭz'ėrd* [F. *gésier;* prov. F. *greziė*, a gizzard —from prov. F. *gres*, gravel—from mid. L. *gĭgērĭă:* F. *gresil*, gravel]: the strong muscular stomach of birds and of some other animals. The purpose of the gizzard is to complete the process of chymification of food. In most animals this is aided by the teeth, but in birds and some invertebrates that are without teeth the gizzard is provided. It varies in size and structure; in carnivorous birds it is thin and membranous, in granivorous thick and muscular. It is sometimes called the third stomach. Some birds have gizzards fitted with fine teeth or calcareous plates, as do also many insects and crustaceans; others swallow fine pebbles or pieces of gravel which aid the gizzard in grinding food. The skin of the pigeon's gizzard has long been used in the treatment of indigestion or dyspepsia, and in late years the stomachs of sheep and swine, dried and ground to a fine powder, have been similarly employed under the name of 'pepsin.'

GLABELLA, n. *glă-bĕl'lă* [L. *glăbel'lus*, without hair, smooth—dim. from *glăber*, smooth]: in *anat.*, the triangular space between the eyebrows; the nasal eminence lying between the superciliary ridges.

GLABROUS, a. *glā'brŭs* [L. *glaber*, smooth, without hair: It. *glabro:* F. *glabre*]: in *bot.*, smooth; devoid of hair; bald.

GLACÉ BAY, Canada, town of Cape Breton Island and County, Province of Nova Scotia, on the extreme eastern seacoast and on the Sydney & Louisburg R.R., 17 miles east of Sydney. The town and the surrounding district are underlaid with vast deposits of coal and almost the entire population is dependent upon the coal mines, five of which are within the town limits and three others closely adjoining. The Dominion Coal Company employs about 5,000 persons and has a yearly output from their mines of over 4,000,000 tons. There are three banks, branches of those located in other cities. Nearly half the population is Roman Catholic, while the Presbyterians have great predominance over the Evangelical bodies. Saint Joseph's Hospital is the second largest in America and one of the finest in the province. On Table Head, a bleak promontory one mile east of the town, Marconi completed in December 1902 his first transatlantic wireless telegraph and sent his first wireless messages across the Atlantic. The educational system consists of common and convent schools. The town was incorporated in 1901, its affairs being administered by a mayor, elected yearly, and a council of six members, elected for two years. The majority of the population are of Highland Scotch descent. Pop. Glacé Bay and surrounding collieries (1901) 6,945; (1905) 16,000.

GLACIAL, a. *glā'shal* [F. *glacial*, icy—from L. *glaciālis*—from *glăciēs*, ice: It. *glaciale*]: consisting of ice; frozen; relating to glaciers. GLACIERS, n. plu. *glăs'ĭ-ĕrz*, or *glā'shĭ-ĕrz* [a Savoy word—from F. *glacier*]: vast fields or accumulations of ice, or snow and ice, which collect in the valleys and ravines of snow-capped mountains like the Alps, and slide downward till they melt in warmer regions —the mounds of débris which they often leave in their movements downward being called *moraines*, and the deep dangerous rents in them being called *crevasses* (see GLACIER below). GLACIATION, n. *glā'shĭ-ā'shŭn*, the act of freezing; the effects of glaciers on a country, as the rounding of hills, the scratching of rocks, the production of moraines, etc. GLACIER-TABLES, the name given to large table-like blocks of stone lying on the surface of glaciers in Alpine regions. GLACIÈRES, n. plu. *glăs'sĭ-ĕrz* [F. *glacières*, ice-houses]: a name given to caves full of ice, found chiefly in the Alpine mountains.

GLA'CIAL PE'RIOD, or ICE AGE: in Geology, the period when the greater part of the n. hemisphere was enveloped in one great ice-sheet. This period belongs to the post-tertiary in the geological succession, and is important in its relations to the general question of the earth's

history, and especially to the appearance of man upon the earth. Its existence is easily traced in the numerous relics which it has left. These are chiefly: (1) The till or boulder clay, believed to be the product of the grinding process by which the glaciers smoothed down the surface of the land, consisting of mud of various colors, according to the nature of the rock from which it has been derived. The name boulder clay is due to the number of irregular-shaped stones of various sizes found mixed with it; (2) Perched blocks and erratics, that is, large angular blocks found resting on hill-tops, hill-slopes, and occasionally low grounds, and which have been borne some distance from the ledges from which they were derived, being carried by glaciers, and stranded in their present position by the melting of the ice; (3) Kames, eskers, etc., i.e. long ridges, mounds, and conical heaps, or undulating accumulations and terraces of gravel and sand, evidently formed by the waters that escaped from the melting glaciers; (4) Moraines, heaps of angular earthy débris, and marking the point where the glacier front remained stationary for a time. All these are collectively termed glacial deposits, and are characteristic of the Glacial or Ice Age: see PLEISTOCENE.

These deposits contain abundant evidences of their origin. The stones found in the boulder clay are usually more or less smoothed and polished, and marked with striæ or scratches. The rock-surface on which the deposit rests is often well smoothed and striated. Such striated surfaces in a great part of Europe and N. America are due to the action of great confluent glaciers, underneath which the country was at one time buried to a depth of thousands of feet. Rocks which have been rounded into dome-shaped bosses and hummocks by ice, are called *roches moutonnées*. The stony or boulder clays are unfossiliferous as a rule, but in maritime regions they sometimes contain marine shells of northern and arctic species. The shells are often crushed and broken. In Scotland, the till contains, in some places, intercalated or interglacial beds of freshwater origin, which have yielded remains of mammoth, Irish elk, reindeer, horse, and urus or great extinct ox. Peat, also, and remains of oak, alder, and other plants, have been found in the same position. In England, especially in Lancashire and in the old district of East Anglia, and in Ireland, marine deposits of sand, gravel, etc., containing shells which indicate temperate conditions of climate, occur intercalated between upper and under masses of stony clay. The highest level at which these shelly deposits have been found in Britain is in N. Wales, 1,390 ft. above the sea.

The chief lessons which the deposits of this period teach are these: (1) The cold of the glacial period came gradually on until it reached a climax; at this time the northern temperate regions were enveloped in one great ice-sheet; (2) This intense arctic condition was interrupted more than once by intercalated mild periods, when the ice

melted away, and the land was clothed with vegetation, and occupied by a well-marked mammalian fauna; (3) During the accumulation of the glacial deposits, there were one or more periods of submergence; (4) The last stage of the period was one of cold, which passed gradually away.

During the Pleistocene period, Britain and corresponding parts of America, had assumed much of their present configuration, but there were several considerable oscillations of level. It was a period of great alternations of cold and warm climatic conditions. The men who then occupied Britain were a savage race, who used rudely chipped flint implements, and were contemporaneous with many mammalian animals, some of which are not now found in temperate latitudes, while others are confined now to arctic and southern latitudes, and yet others are wholly extinct. Similar climatic conditions are known to have obtained in various regions during this period. Scandinavia, like Britain, was invested with an ice-sheet which filled up the Baltic, and extended into n. Germany. All N. America was covered with ice down to an irregular line running w. from the latitude of New York. But in Sweden, Switzerland, Carinthia, Piedmont, Lombardy, and N. America there are interglacial deposits, which point to great fluctuations of climate like those which obtained in Britain during the so-called Glacial period. The Swiss interglacial deposits have recently yielded relics of man.

It is not yet possible to offer a wholly satisfactory theory of glacial temperature.

Three theories have been largely held. (1) The elevation theory according to which elevation of northern lands permitted the great accumulation of snow. The occurrence of elevations is undoubted but their relation to glaciation is not established.

(2) The astronomical or Crollian theory proposed, elaborated and ably defended by Mr. Croll. Its chief difficulties are that it calls for a succession of glacial periods at such intervals that the time is evidently lacking for the production of the results.

(3) The atmospheric theory which seeks to account for the phenomena by changes in the amount of moisture and carbon dioxid in the air with other favoring conditions. Moisture and carbon dioxid when present prevent the escape of heat as does the glass of a green-house. In any way render the quantity of these substances less, and loss of heat and its accompanying phenomena will ensue. This last theory is now regarded with much favor and is fully expounded in the writings of Chamberlin and Sualisbury.

GLA'CIER: immense mass of ice, formed above the snowline on lofty mountains, and descending into the valleys to a greater or less distance, often encroaching on cultivated regions. The materials of glaciers are derived from the snow which falls during summer as well as winter

on the summits of high mountains. Avalanches and glaciers carry the snow into warmer regions, where it is reduced to water; in the one, the snow slips from the steep mountain slopes, and rushes rapidly down; in the other, it gradually descends, and is converted into ice in its progress. The snow which forms the glacier at its origin has a very different appearance and consistence from the ice of which it consists at its lower termination. The minute state of division of the ice, in its snow condition, and the quantity of air interspersed through it, gives it its characteristic white color. Two causes operate in causing this change into ice: first, pressure expels the air, by bringing the particles of the lower layers of snow more closely together; and second, the summer's heat melting the surface, the water thus obtained percolates through the mass beneath, and as it passes among the particles whose temperature is below 32° F., it increases their size by external additions till the particles meet, and the whole becomes a solid mass. The snowy region of the glacier is called the *névé*. In large glaciers, the névé is of great extent, a large quantity of material being required to make up the waste. The névé is, however, often confined to narrow valleys, and, as a consequence, produces glaciers which soon perish. The increase of a glacier by snow falling on its surface takes place only above the snowline—below that line, all the accumulated winter's snows are speedily melted by the summer's heat.

The most remarkable feature of glaciers is their motion. See the writings of Agassiz, Forbes, and Tyndall. The continual waste of glaciers below the snow-line, both along its surface and at its extremity, is ever being replaced. To account for motion, Charpantier supposed the water, which saturated the glacier in all its parts, and filled the innumerable capillary fissures, was, during night and during the winter, frozen, and that the well-known and almost irresistible expansion which would take place in the conversion of the water into ice, furnished the force necessary to move the glacier forward. This theory, known as the *dilatation theory*, was for some time adopted by Agassiz, but ultimately abandoned. Agassiz showed that the interior of the glacier had a constant temperature of 32° F., and subsequent observations have shown that the glacier moves more rapidly in summer than in winter. In 1799, De Saussure published a second theory, known as the *gravitation* or *sliding theory*, in which he supposed that the glacier moved by sliding down the inclined plane on which it rested, and that it was kept from adhering to its bed, and sometimes even elevated by the water melted in the contact of the glacier with the naturally warmer earth. While correctly attributing the motion to gravity, De Saussure erred in considering glaciers as continuous and more or less rigid solids—indeed, the motion he attributes to them would, if commenced, be accelerated by gravity, and dash the glacier from its bed as an avalanche. Principal Forbes was the author of the

next important theory. Considerable attention had meantime been given to the subject by Rendu, Agassiz, and others. Rendu had shown that the glacier possessed a semi-fluid or river-like motion in explaining the difference between observations made by him at the centre, which 'moves more rapidly,' and others made at the sides, 'where the ice is retained by the friction against its rocky walls.' The results based on Rendu's observations were established by the repeated and exact measurements of Forbes, who in the progress of his examinations, made the further discoveries, that the surface moves more rapidly than the ice near the bottom, and the middle than the sides; that the rate of motion is greater where the glacier-bed has the greatest inclination; and that the motion is continued in winter, while it is accelerated in summer by the increase of the temperature of the air. The only theory which, as it appeared to Forbes, could account for these phenomena is thus expressed by him: 'A glacier is an imperfect fluid or a viscous body which is urged down slopes of a certain inclination by the mutual pressure of its parts': this is known as the *viscous theory*. He considered a glacier as not a crystalline solid, like ice tranquilly frozen in a mould, but that it possessed a peculiar fissured and laminated structure, through which water entered into its intrinsic composition, giving it a viscid consistence similar to that possessed by treacle, honey, or tar, though less in degree. Prof. Tyndall has published another theory, which he designates the *pressure theory*. This differs little from that of Forbes, except that it denies that glacier ice is in the least viscid. It is evident that any explanation of glacier movement must be one which will apply to all parts of the ice stream. In the upper part where the crystalline granules are discrete this movement is certainly due to the shifting of the particles with reference to one another. Since this crystalline granular character is observable in all parts of the glacier even the most apparently homogeneous we are rather forced to the opinion that here too the movement is a shifting of the granular elements. In a strictly viscous liquid such as tar there is no such crystalline structure. A flow such as Forbes urges is therefore not possible. It seems more reasonable to assume that where the temperature is near the freezing point that shifting pressure may cause minute and local liquefaction which would permit the exceedingly slight movement of the individual granules necessary to the extremely slow flow. The moment the pressure was relieved by movement the infinitesimal portions of water would freeze again and so maintain an apparently unbroken solidity.

Some of the more remarkable phenomena of glaciers remain to be noticed. The mountains which rise on either side of the valley occupied by the glacier are continually suffering loss from the action of the rain, disruption by frost, and the impulse of avalanches. The materials thus liberated find their way to the glacier and form a line of

1. The Illecillewat Glacier, Mount Sir Donald, Selkirk Mts., British Columbia.
2. Front of the Muir Glacier.

rock and rubbish on its two borders, of greater or less size, dependent on the friability or compactness of the adjacent mountains. These *lateral moraines* often reach to a great height, as much as 40 or 50 ft, above the level of the glacier. The whole ridge appears to consist of débris, but it is really a ridge of ice with a covering of foreign materials, which by protecting the underlying ice from the heat which they radiate and only partially transmit, leave the moraine as a more and more elevated ridge, while the surface of the glacier is speedily melting. *Glacier tables* have a similar origin. A large and isolated mass of rock, resting on the glacier, protects the ice below; and as the glacier melts, it leaves the rock poised on the summit of an icy column. As the rays of the sun play on the table all day obliquely, the column is gradually melted from under the rock, until it slips off, and begins to form another table; while the unprotected column speedily melts and disappears. Where two glaciers unite, the trails of rock on the inner margins unite also, and form a single ridge, which runs along the middle of the large trunk glacier, and is called a *medial moraine.* It is evident that the number of the medial moraines must thus depend on the number of the branch glaciers, and must indeed be invariably one less. At the point where the front of the glacier remains stationary for any length of time a heap of rubbish accumulates *the terminal moraine.* This consists of finely ground material pushed beneath the glacier, material brought within the ice and the lateral and medial moraines of the surface. Sometimes a glacier decreases in size, either withdrawing from the valley and leaving the terminal moraine as a barren waste of rocks, or melting on its superficies throughout its length, and depositing its lateral moraines as a ridge of débris on either side at some height above it on the mountain. The existence of such collections of rocks is plain evidence of the former position and altitude of glaciers and even of their former occurrence in countries where they are now unknown.

It has been stated, that when the glacier is subjected to tension, the continuity of its parts is destroyed, and fissures, called *crevasses*, are formed. In passing over a brow on the channel, the ice invariably yields; at first, a deep crack is formed, which gradually widens until a fissure or chasm is produced across the glacier. Transverse crevasses disappear when the glacier reaches a level portion of its bed; the pressure bringing the walls again together, the chasm is closed up. Longtitudinal crevasses are produced when the glacier escapes from a confined channel, and spreads itself over a wider area. The spreading of the margins causes a tension in the body of the glacier, which yields, and longitudinal fissures are formed. These occasionally rend the terminal front of a glacier. The smaller marginal crevasses are formed from the tension of the ice, produced by the normal motion of the glacier being retarded by the friction against the

sides of its channel. The motion of the glacier is gradually accelerated from the margin inward, consequently the lines of greatest tension are inclined downward and toward the centre, more or less, in proportion to the rapidity of the motion. The crevasses formed by the yielding of the ice are at right angles to the lines of tension, and consequently point up the glacier.

The *veined structure* is apparently the result of pressure. The veins consist of blue ice penetrating the white mass of the glacier, and occur either in irregular directions, or producing a regularly laminated structure. The blue veins are portions of ice from which the air-bubbles have been expelled, and which are consequently more compact than the general substance of the glacier. The pressure is exerted in three directions, producing veins complementary to the three kinds of crevasses above noticed. When the glacier passes over a level, or perhaps a gently rising channel, transverse veins are formed; when it is pressed through a narrower channel, longitudinal veins are produced; and the pressure at the margins produced by the retardation of the flow by friction causes the formation of marginal veins in the lines of greatest pressure, that is, at right angles to the marginal crevasses.

The melting of the ice on the surface of the glacier produces streams, whose course is often broken by crevasses, down which the water descends, finding egress at last through the cavernous mouth at the termination of the glacier, where it issues after being increased by other streams, which have by similar channels reached the bottom, as well as by the melting of the ice from the contact of the earth. The rushing water wears a shaft of greater diameter than the crevasse, and this shaft often remains after the margins of the crevasse have been reunited. In the progress of the glacier another crevasse intersects the bed of the stream, and down this the water is diverted, leaving the formed shaft or *moulin*, as it is called. The forsaken moulin has at its base a quantity of earth and stones collected by the stream from the surface of the glacier; these are gradually raised to the surface by the melting of the glacier, and eventually appear as cones of débris, sometimes rising high on columns of ice under the same influences as the glacier tables.

Glaciers are not necessarily peculiar to any country or zone, but wherever there are mountains of sufficient height, it may be expected that they may exist. In Europe, they are chiefly confined to the Alps and Norway. Having their origin in the region of perpetual snow, they reach far down into the valleys, the largest pushing themselves furthest down. That of Bossous at Chamouni, which comes from the highest part of Mont Blanc, reaches a point 5,500 ft. below the snow line, where it is embosomed among luxuriant wood. The Himalaya has its share; and in 1880, Mr. Whymper found that many of the chief peaks of the Andes are flanked by extensive glaciers. Iceland and Spitzbergen abound in them. In northern

localities the ends of the glaciers, resting on the waters of the ocean, are broken off, and float away as icebergs.—See GLACIAL PERIOD.

GLACIS, n. *glâ′se*, or *glā′sĭs* [F. *glacis*—from L. *glăcĭēs*, ice, allied to glade in the sense of a lawn]: a gentle slope; a smooth sloping bank: in fortification (q.v.), a bank of earth, usually turfed, bare and open, and gently sloping from the covered-way toward the country: its object is to bring assailants, as they approach, into a conspicuous line of fire from the parapet of the fortress, also to mask the general works of the place.

GLAD, a. *glăd* [Sw. *glad*, joyful: Dan. *glat*, smooth, slippery; *glad*, joyous: Icel. *gladr*, bright, shining: comp. Gael. *tlachd*, pleasure]: pleased; elevated with joy; wearing the appearance of joy; expressing joy, as a glad sound; moderately joyful: V. to gladden or make glad. GLAD′LY, ad. *-lĭ*, with pleasure. GLAD′NESS, n. a moderate degree of joy; pleasure of mind. GLADDEN, v. *glăd′n*, to cheer; to please; to excite joy in. GLAD′DENING, imp. *-nĭng:* ADJ. cheering; exhilarating. GLADDENED, pp. *glăd′nd*. GLAD′SOME, a. *-sŭm*, pleased; joyful; causing joy. GLAD′SOMELY, ad. *-lĭ*. GLAD′SOMENESS, n. *-nĕs*, moderate joy; pleasure of mind.—SYN. of 'glad': joyful; joyous; delighted; gratified; exhilarated; animated; cheerful; exhilarating; animating.

GLAD′BACH, or MÖNCHEN-GLADBACH, *mön′ċhėn-glâd′-bâċh:* rapidly growing manufacturing town of Rhenish Prussia, 14 m. w. of Düsseldorf. Linen, cotton, and silk and damask are manufactured; there are dye-works and bleachfields, iron-foundries, and machine-shops. It has an evangelical and three Rom. Cath. churches—one of the latter having a crypt dating from the 8th c. and a nave from the beginning of the 12th c. Gladbach is a very ancient town, and formerly contained a famous Benedictine abbey, founded 972. Pop. 75,000.

GLADDEN, *glăd′ėn*, WASHINGTON, D.D., LL.D.: Congl. minister: b. Pittsgrove, Penn., 1836, Feb. 11. He graduated at Williams College 1859, studied theology, was ordained pastor of the State Street Congl. Church Brooklyn, 1860, and has held pastorates in Morrisania, N. Y., 1861, North Adams, Mass., 1866–71, North Ch., Springfield, Mass., 1875–83; and First Cong. Ch., Columbus, O., 1883–. From 1871 till 75 he was on the editorial staff of the New York *Independent*, and 1878–80 was editor of *Sunday Afternoon*. He has contributed frequently to secular and religious periodicals, achieved wide reputation as a lecturer on social questions, and published *Plain Thoughts on the Art of Living* (Boston, 1868); *From the Hub to the Hudson* (1869); *Workingmen and Their Employers* (1876, 85); *Being a Christian* (1876); *The Christian Boy* (1877); *The Lord's Prayer* (1881); *The Christian League of Connecticut* (1883); *Things New and Old* (1884); *The Young Men and the Churches* (1885); *Applied Christianity* (1887); *Parish Problems* (1888); *Burning Questions* (1889); *Who*

Wrote the Bible (1891); *Tools and the Man* (1893); *Social Facts and Forces* (1897); *Art and Morality* (1897); *The Christian Pastor* (1898); *How Much is Left of the Old Doctrine* (1899); etc. He received the degree D.D. from Roanoke College 1884, and LL.D. from the Univ. of Wis. 1881.

GLADE, n. *glād* [Norw. *glette*, a clear spot among clouds: Icel. *glita;* Scot. *gleit*, to shine: Dan. *gade*, a street]: an opening or passage in a wood through which the light may break in and shine; any long opening or space in a wood or plantation, covered as a lawn with grass.

GLADE-NET: net used for capture of birds, especially woodcocks, in the glades of forests. It is made of a breadth suitable to the glade through which the birds are accustomed to pass; and is made of fine thread-netting, edged with cords, having weights attached to it below. It is hung so that when the rope by which it is held up is let go, it falls at once to the ground; a rope from the upper part of it passing over a pulley in a tree, and being held by the hand of the fowler. When the net is ready, the neighboring parts of the woods are beaten to disturb the woodcocks; and when they approach it, it is let down, or drawn up, as may be necessary. Sometimes hares are caught in this way. In England the use of the glade-net is chiefly by poachers and dishonest gamekeepers.

GLADHEIM: in Scandinavian mythology (q.v.), vast and noble structure, the home of Odin, in which is Valhalla (hall of heroes), radiant abode of those slain in battle.

GLADIATE, a. *glăd'ĭ-āt* [L. *glădĭŭs*, a sword]: in *bot.*, shaped like a short straight sword. GLAD'IATOR, n. *-ā-tėr*, [L.]: a prize-fighter with swords; in *anc. Rome*, a man who engaged in mortal combat with another for the entertainment of the people. GLAD'IATO'RIAL, a. *-tō'rĭ-ăl*, pertaining to; also GLAD'IATORY, a. *-tėr-ĭ*. GLAD'IA'TORSHIP, n. *-tėr-shĭp*, the conduct or quality of a gladiator.

GLAD'IATOR: in classical antiquity, one who fought in the arena, at the amphitheatre at Rome, and in other cities, for the amusement of the public. The gladiators were generally slaves bought and trained for the purpose, by masters who made this their business. The custom is supposed to have been borrowed from the East, and to have had its origin in the practice of human sacrifices, or that of taking the lives of captives or prisoners of war, in honor of heroes who had died in battle. Thus, in the *Iliad*, we read that Achilles sacrificed 12 Trojan prisoners to the manes of his friend Patroclus, and Virgil speaks of captives sent to Evander, to be sacrificed at the funeral of his son Pallas. The 'great custom' of the king of Dahomey thus has its counterpart in classic antiquity; and the N. American Indians, in putting their prisoners to death with tortures, have reproduced an ancient barbarism.

After a time all considerable funerals were solemnized by

human sacrifices, which took the form of combats, in which, to increase the interest of spectators, the prisoners were required to sacrifice each other; and as prisoners, and afterward other slaves, were kept for this purpose, they were trained to fight with skill and courage, to make the spectacle more impressive. These contests took place first at funerals, but afterward in the amphitheatre; and in process of time, instead of a funeral rite, became a common amusement. The first recorded in Roman history was the show of a contest of three pairs of gladiators, given by Marcus and Decius Brutus, on the death of their father, in the year of Rome 490 (B.C. 264). Forty-seven years afterward a show of 22 pairs was given in the Forum. Ten years later the first Africanus diverted his army at New Carthage with a gladiatorial exhibition. The fashion then rapidly increased. Magistrates, public officers, candidates for the popular suffrages, gave shows to the people, which consisted chiefly of these bloody and generally mortal encounters. The emperors exceeded all others in the extent and magnificence of these cruel spectacles. Julius Cæsar gave a show of 320 couples; Titus gave a show of gladiators, wild-beasts, and sea-fights, for 100 days; Trajan gave a show of 123 days, in which 2,000 men fought with and killed each other, or fought with wild-beasts for the amusement of the 70,000 Romans, patricians and plebeians, the highest ladies and the lowest rabble, assembled in the Colosseum. Domitian, at the Saturnalia of A.D. 90, arranged a battle between dwarfs and women. An edict forbidding women to fight was passed as late as A.D. 200. A vast number of slaves from all parts of the world were kept in Rome and trained for these exhibitions. There were so many at the time of Catiline's conspiracy, that they were thought dangerous to the public safety, and it was proposed to distribute them among the distant garrisons. This sport grew so popular throughout a large part of the Roman empire that from Britain to Syria every considerable town had its arena.

Efforts were made to limit the number of gladiators, and diminish the frequency of these shows. Cicero proposed a law, that no man should give one for two years before becoming a candidate for office. Emperor Augustus forbade more than two shows in a year, or that one should be given by a man worth less than half a million sesterces.

These shows were announced by show-bills and pictures, like the plays of our theatres. The gladiators were trained and sworn to fight to the death. If they showed cowardice, they were killed with tortures. They fought at first with wooden swords, and then with steel. When one of the combatants was disarmed, or upon the ground, the victor looked to the emperor if present, or to the people, for the signal of death. It was formerly thought that the thumb raised meant that his life should be spared, and the thumb turned downward meant death. Now it seems agreed that to close down the thumb was a sign of appro-

bation; to extend it, of disapprobation. A gladiator who had conquered was rewarded with a branch of palm, and sometimes with his freedom. Though the gladiators at first were slaves, freemen afterward entered the profession, and even knights. Senators and knights fought in the shows of Nero, and women in those of Domitian. The emperor Constantine prohibited the contests of gladiators, A.D. 325; but it was not till 500 that they were finally abolished by Theodoric.

GLADIOLUS, n. *glă-dī′ŏ-lŭs*, popularly *glăd′ĭ-ō′lŭs* [L. a small sword—from *glădĭŭs*]: genus of plants of the nat. ord. *Irideæ*, with a tubular perianth, the limb of which is divided into six unequal segments, thread-like, undivided stigmas, and winged seeds. The roots are bulbous; the leaves linear or sword-shaped, whence the name. The Cape of Good Hope produces the greater number of the known species, as well as of several allied genera formerly included in this. A few, however, are natives of other countries, and two or three are found in Europe. Most of the species have flowers of great beauty. They are propagated either by seed or by offset bulbs; and in the former way many fine new varieties have been produced. Among popular names of the various species are sword-lily, and corn-flag. Extraordinary medicinal virtues were formerly ascribed to the bulb of *G. communis*, one of the European species. The Hottentots eat the bulbs of some of the species, which contain a considerable quantity of starch. GLADIOLE, n. *glăd′ĭ-ōl*, a lily-like plant of the genus gladiolus; the court-flag. GLADIUS, n. *glăd′ĭ-ŭs* [L. a sword]: the horny endoskeleton or pen of certain cuttle-fishes.

GLAD′STONE, HERBERT JOHN, English politician: b. London 1854, Jan. 7. He was educated at Eton and Oxford. He was private secretary to his father 1880–1; under-secretary home office 1892–4; first commissioner of works 1894–5; and Secretary of State for Home Affairs 1905. He sat in Parliament for Leeds 1880–5, and for Leeds West from 1885.

GLADSTONE, JOHN HALL, English scientist: b. London 1827; d. 1902, Oct. 6. He was Fullerian professor of chemistry at the Royal Institution 1874–7, and a member of the London School Board 1873–94. He published: *Life of Michael Faraday* (1872); *Spelling Reform from an Educational Point of View* (1878); *Chemistry of Secondary Batteries* (1883).

GLADSTONE, *glăd′ston*, The Right Hon. WILLIAM EWART: statesman and orator: b. at Liverpool, 1809, Dec. 29; d. Hawarden, 1898, May 19; fourth son of Sir John Gladstone, Bart., of Fasque, in Kincardineshire, Scotland. His father, originally of Leith, had won eminence and wealth as a West India merchant in Liverpool. Gladstone was sent to Eton, and afterward to Christ Church, Oxford, where he closed a brilliant college career by taking a double first-class degree 1831. He entered the house of commons 1832 for the borough of Newark. He held the post of lord

of the treasury, and afterward that of under-sec. of state for the colonies in the Peel govt. for a few months 1835. In 1838, he published his first work, *The State in its Relations with the Church*, which gave occasion to Mr. Macaulay to describe him, in a celebrated review of his work, as a 'young man of unblemished character, the rising hope of those stern and unbending tories' who followed Sir Robert Peel while they abhorred his cautious temper and moderate opinions. In 1841, Gladstone became vice-pres. of the board of trade in the Peel administration, and 1843, pres. of the board. Next to his chief, he took the most prominent part in the revision of the tariff and reduction of import duties, which reached their natural development in the repeal of the corn laws. He resigned office 1845, Feb., when Sir R. Peel proposed to increase the endowments of the College of Maynooth. He rejoined the ministry 1845, Dec., succeeding the Earl of Derby as colonial secretary. He rendered Sir R. Peel eloquent and effective aid in carrying the great measure of free-trade through the house of commons; but paid the penalty in the loss of his office and his seat, for the then Duke of Newcastle, claiming to 'do what he liked with his own.' refused to sanction his re-election for Newark. In 1847, he was elected M.P. for the Univ. of Oxford, which he continued to represent for 18 years. He visited Naples 1850. The dungeons of the kingdom of the Two Sicilies at this period swarmed with political prisoners, and Gladstone, in a letter to the Earl of Aberdeen, made all Europe ring with the story of their sufferings and their wrongs; and afterward he advocated the cause of Italian independence in many eloquent speeches. In 1851, he opposed the Ecclesiastical Titles Bill, brought in by Lord John Russell. After refusing an offer of office under Lord Derby, he became chancellor of the exchequer in the coalition govt. formed by the Earl of Aberdeen 1852. This may be regarded as the turning-point in Gladstone's political career. Till this time he might be described as a tory or a Peelite; he afterward was a liberal. When the Aberdeen govt. fell before a motion in the house of commons for inquiring into the state of the army before Sebastopol, Gladstone continued for a brief period a member of the cabinet of Lord Palmerston, but soon retired. Gladstone then went into opposition, and 1857 made an eloquent and damaging speech on Mr. Cobden's motion condemnatory of Sir John Bowring's proceedings in China, which brought about the defeat of Lord Palmerston, and the dissolution of parliament. In 1858, Gladstone accepted a special mission of importance to the Ionian Islands. In the same year, he published an elaborate work, *Homer and the Homeric Age*, 3 vols. In the second Palmerston administration, he resumed the post of chancellor of the exchequer. In 1860, he carried through parliament a commercial treaty with France. His financial scheme that year involved among other proposals the abolition of the paper-duty, which

was strongly but unsuccessfully opposed in the house of commons. In the upper house, the Paper-duty Repeal Bill was thrown out on financial grounds. Gladstone boldly denounced this interference with the taxing privileges of the commons. In 1861, he incorporated the repeal of the paper-duty in the successful financial scheme of the year. Rejected by his academic constituency at the general election 1865, he was returned by S. Lancashire. In 1866, Gladstone now leader of the house of commons, brought in a Reform Bill, whose defeat caused Earl Russell to resign. At the general election 1868, S W. Lancashire rejected, and Greenwich returned him. Acceding to office as first lord of the treasury at the close of that year, Gladstone, 1869, disestablished the Irish Church; 1870, carried his Irish Land Bill; 1871 abolished, by the exercise of the royal prerogative, purchase in the army; and 1872 carried the Ballot Bill. The Washington Treaty, dealing with the Alabama claims, was negotiated 1871. The Judicature Act passed 1873; but a govt. measure on Irish university education having been rejected, the ministry resigned. As Mr. Disraeli declined to form a govt., Gladstone returned to office; but 1874 he unexpectedly dissolved parliament, and, on the unfavorable result of the ensuing election, the Gladstone ministry resigned. Gladstone was re-elected for Greenwich. In 1875 he retired from the formal leadership of the liberal party in the house of commons. In 1876 he led in denouncing the cruelties perpetrated by the Turks in Bulgaria, and in protesting against all attempts, especially by England, to bolster up the effete Ottoman power at the expense of the subject Christian races. During the next three years, the Eastern Question largely engrossed the British political world; and Gladstone advocated the diplomatic coercion of Turkey by the concerted European powers. He also raised an energetic protest against the government's 'imperialistic' policy in Afghanistan and s. Africa. In 1880, Mar., parliament was dissolved, and the new elections gave the liberals an overwhelming majority; the most exciting contest being that which returned Gladstone for Midlothian. Ere the new parliament met, Gladstone, again the actual leader of the liberal party, was made prime minister. In its foreign policy, the new govt. sought to secure the carrying out by Turkey of the yet unfulfilled conditions of the Berlin Treaty: Afghanistan was evacuated by British troops; and conciliatory terms were granted to the rebellious Boers of the Transvaal. In Ireland, where numerous agrarian crimes accompanied a wide-spread agitation for the suppression of 'landlordism,' a Coercion Bill was speedily followed by the conciliatory Land Act of 1881. In 1881, Gladstone's cabinet felt itself compelled to interfere in Egypt, and had to dispatch three military expeditions thither in 1882 and 84. Gladstone carried a new Franchise Bill 1884, and a Redistri-

bution Bill 1885; in which latter year he gave place for seven months to a conservative govt. under Lord Salisbury. Restored to power through the general election of 1885, Nov., he again appealed to the country in the summer of 1886 on the defeat of his Irish Home Rule and Land Purchase Bills by the conservatives and unionist liberals (Hartington, Goschen, Trevelyan, Bright, etc.); and once more defeated, he again gave place to Lord Salisbury.

After his conversion to 'home-rule' for Ireland he zealously advocated its principles and necessity, in and out of parliament. He opposed the coercive measures of 1888–9, denounced the arrest and severe prison treatment of Irish members of parliament and other home-rule leaders, championed the freedom of speech, and warned the party in power of the certain progress and early triumph of liberal principles. On the exposure of the forgeries of the alleged Parnell letters before the parliamentary commission 1889, Feb., he again demanded justice for Ireland and denounced the govt.'s aid in the prosecution of the London *Times* case against Parnell and his associates. In the by-elections of Feb. and Mar. for parliament the Gladstonian candidates were generally successful, a result attributed to the govt.'s excessive measures, and believed by many to indicate an early return of Gladstone to power. He thus summd up his opinions on the situation Mar. 14, 'the Irish crisis has become acute to an unusual degree, and is pressing itself beyond all former experience on the mind and conscience of the people of England.' After the O'Shea divorce (see PARNELL, CHARLES STEWART), Gladstone urged the retirement of Parnell from the leadership of the Irish party. Parnell responded with a manifesto (1890, Nov. 28) soliciting retention and disclosing confidential conferences with liberal leaders; whereupon Gladstone refused further aid, unless Parnell was displaced. Dec. 6 a majority of the nationalist members of parliament chose Justin McCarthy leader. In the general parliamentary elections 1892, July, Gladstone secured a majority of forty in the new house of commons, which assembled Aug. 4, and Aug. 10 he was summoned by the queen to form a new government. He then courageously addressed himself to the carrying through parliament of a bill giving Ireland self-government. After prolonged discussion of many amendments the bill was finally passed by the commons, 1893, Sep. 2, by a vote of 303 to 269. In this fierce debate of more than 80 days, Gladstone's leadership was continuous and conspicuous. The bill was thrown out by the house of lords, after 4 days' debate, by a vote of 419 to 41. When the commons reassembled Gladstone gave notice, indirectly, that the subject of home rule would not be reintroduced to the sittings. The closing hours of the parliament prorogued 1894, Mar. 5, were made memorable by the retirement of Gladstone from the premiership. With mental powers and vital energy still unimpaired, he found himself compelled by the merely physical infirmities of extreme age

to decline longer to bear the burden of government. His withdrawal was received with dismay by his own party, with elation by his opponents, and with doubt and suspicion among his Irish allies. Gladstone favored Lord Rosebery as his successor, and his choice was soon found to be the choice of the majority of the recognized local leaders in the Liberal party. In 1895 and subsequently, Gladstone gave serious and forceful attention to the horrors in Armenia, and speeches and letters made and written by him have gone far to increase English opposition to the bloodthirsty rule of the sultan. He died in his 89th year from cancer and tuberculosis of the bone. Among Gladstone's works are: *The State in its Relations with the Church* (1838); *Church Principles Considered* (1840); *A Manual of Prayers* (1845); *Remarks on Recent Commercial Legislation* (1845); *Studies on Homer and the Homeric Age*, 3 vols. (1858); *Essay on 'Ecce Homo'* (1868); *A Chapter of Autobiography* (1868); *Juventus Mundi: the Gods and Men of the Heroic Age* (1869); *The Vatican Decrees in their Bearing on Civil Allegiance: a Political Expostulation* (1874); *Vaticanism: an Answer to Replies and Reproofs* (1875); *Homeric Synchronism: and Inquiry into the Time and Place of Homer* (1876); *Bulgarian Horrors and the Question of the East* (1876); *Lessons in Massacre: an Exposition of the Conduct of the Porte in and about Bulgaria since May*, 1876 (1877); *Gleanings of Past Years* (1879); *The Irish Question* (1886); *Robert Elsmere and the Battle of Belief* (1888); *Landmarks of Homeric Study* (1890); and *The Impregnable Rock of Holy Scripture* (1890).

GLAGOL, *glâ'gol*, or GLAGOLITZA, *glâ-gol-ĭt'za*, or GLAGOLITES, *glâ'gol-īts* [word or speech]: ancient Slavonic alphabet, used principally in several Rom. Cath. dioceses of Istria and Dalmatia, in the psalms, liturgies, and offices of the church. Among these Illyrian adherents to the communion of Rome, mass is celebrated not in Latin, but in an anc. Slavonic dialect, written in this peculiar alphabet, whose invention is popularly attributed to St. Jerome. The use of this liturgy was confirmed to the priesthood by a bull of Pope Innocent IV., 1248. Of the antiquity of this alphabet, the savants have held great variety of opinions. Dobrowsky laid the foundation of a critical investigation of the subject, and has been followed by Kopitar, Jacob Grimm, Ivan Preis, etc. A Glagolitic MS. of the 11th c., belonging to Count Kloz, published under the title of *Glagolita Clozianus* (Vienna 1836), proves a higher antiquity than some had been willing to allow. Good authorities hold that Isaac Taylor, in his work on *The Alphabet* (1883), has proved the glagol to be derived from the cursive Greek alphabet of the 9th c. The name is supposed by Kopitar to have been taken from the word *glogolati*, which, though unknown to the Servo-Croatians, signifies, in the ecclesiastical idiom, *to speak*.

GLAIR, n. *glār* [Scot. *glair*, or *glaur*, mud or slime: F. *glaire*, white of an egg—from mid. L. *clārā*, white of an

egg—from L. *clārŭs*, clear]: the white of an egg; any viscous transparent substance resembling it: V. to smear or varnish with the white of an egg. GLAIR'ING, imp. GLAIRED, pp. *glärd*. GLAIR'Y, a. *-ĭ*, having the character of glair; slimy. GLAIRE, n. *gläir*, the white of an egg beaten up in an equal amount of water, a little sugar-candy being added, used as a glaze for pastry.

GLAIRE, *glair*, JEAN BAPTISTE: 1798–1879; b. Bordeaux: Orientalist and theologian. He received a classical education, studied theol., published a *Hebrew and Chaldee Hand-Lexicon* (1830), an *Arabic Concordance of the Koran*, and other works, was chosen prof. of Hebrew at the Sorbonne, 1841 and became councilor of the Univ. 1845.

GLAISHER, *glā'shėr*, JAMES, F.R.S.: astronomer: b. London, England, 1809, April 7; d. Croydon, Surrey, 1903, Feb. 7. He was appointed asst. on the principal triangulation of the ordnance-survey of Ireland, and charged with the meteorological observations on Bencarr Mountains in Galway 1829, was asst. at the Cambridge Observatory 1833–6, was appointed asst. in the astronomical dept. of the Royal Observatory in Greenwich 1836, and was supt. of the magnetical and meteorological dept. of the observatory 1840–74 Between 1863 and 66 he made 29 balloon ascents for scientific purposes, in one of which (1863, Sep. 5) he attained a height of nearly 7 miles. He was a founder of the Royal Meteorological Soc., its sec. nearly 20 years, and its pres. 1867–78. Was author of over 100 books and papers relating to astronomy, meteorology, and theory of numbers.

GLAIVE, or GLAVE, n. *glāv* [F. *glaive*—from L. *glădĭŭs*, a sword: comp. Gael. *claidheamh*, a sword (see CLAYMORE)] a broadsword; a scimiter.

GLAMORGANSHIRE, *gla-mawr'gan-shėr* [in Welsh, *Gwlad Morgan*]: most southerly of the counties of Wales; bounded s. and s.w. by the Bristol Channel, w. by the county of Caermarthen, n. by Brecknock, and e. by Monmouth; 516,959 acres. Pop. (1901) 601,080. The coastline following the principal windings, is about 90 m. in length, and its irregularities occur chiefly in the w. of the county, and are formed by Swansea Bay and the peninsula of Gower. The whole of the n. district is covered with mountains, the highest of which, however, Llangeinor, is only 1,859 ft. This district comprises one of the richest coal-beds in the kingdom. The s. portion of the county, the 'Vale of Glamorgan,' forms a great level, is richly wooded, with a mild climate, and is by far the most fertile part of S. Wales. Its soil is a reddish clay, resting on limestone, and is excellently adapted for the growth of cereals. The mountainous district is intersected by numerous picturesque valleys affording good pasturage for sheep and cattle. The chief rivers are the Rumney, the Taff, the Neath, the Tawe, and the Llwchwr—all

running southward from the mountains into the Bristol Channel. Besides caol, anthracite or stone-coal, and coking-coal, with ironstone and lead are found. The iron-works at Merthyr-Tydvil are very extensive. At Neath and Swansea are large copper-smelting works. Wheat, barley, oats, and potatoes are the chief crops; and butter and cheese are largely produced. The farms, however, are generally small, and agriculture is in a backward state. Owing to the immense development of the coal and iron-works, the map of the county has of late years become a network of railways and tramways, and no part of Britain is better supplied with means of transport. Glamorganshire sends five members to parliament; and the represented boroughs are Merthyr-Tydvil (with two), Swansea town, and the districts of Swansea and Cardiff, which have one member each. Glamorganshire contains interesting Roman remains, and many memorials of the middle ages. Of these, Oystermouth Castle, Caerphilly Castle, Cardiff Castle, and Margan Abbey, are the finest remaining specimens.

GLAMOUR, n. *glăm'ėr* [Scot.: Dan. *glimmer*, glitter, false lustre]: a charm on the eyes making them see things different from what they are.

GLANCE, n. *glăns* [Ger. *glanz;* Dut. *glans*, lustre, splendor: Dan. *glindse*, to glisten]: a rapid or momentary view; a sudden shoot of light or splendor; a name applied to minerals, chiefly sulphites, possessing a semi-metallic lustre: V. to dart aside; to shoot, as a ray of light or splendor; to fly off obliquely; to snatch a momentary view; in *OE.*, to censure in an indirect or covert way. GLAN'CING, imp. *-sĭng:* ADJ. shooting, darting; casting suddenly; N. the act of one who glances; in *OE.*, oblique censure. GLANCED, pp. *glănst.* GLAN'CINGLY, ad. *-lĭ.*

GLANCE: in Mineralogy, a numerous order or family of minerals, of which *Galena* (q.v.) or *Lead-G.* may be regarded as a type. All are metallic, and many are known by names indicating the metal which is their principal constituent, as *Lead-G.*, *Silver-G.*, *Bismuth-G.*, etc. In these and many other species, the metal is combined with sulphur, so that the mineral is a sulphuret, but there are also numerous species of glance in which sulphur is not present, but selenium, arsenic, or tellurium takes its place. In some kinds also, two or more metals are present instead of one, in combination with one or other of these non-metallic or semi-metallic substances. Thus, *Gold-G.*, or *Silvanite*, consists of gold and silver in combination with tellurium: it occurs in veins in porphyry, in Transylvania, and is wrought for both the precious metals which it contains. Several kinds of glance are very valuable ores, as *Lead-G.* or *Galena*, *Copper-G.* or *Redruthite*, and *Silver-G.* or *Argentite.* Although mineralogists have adopted the names *Pyrites*, *Glance*, and *Blende* as names of orders or families, the limits and distinctions of these groups are not well marked. All kinds of glance are fused without much difficulty by the blow-pipe. They are also soluble in acids.

GLANDERS: virulent and highly contagious disease afflicting the equine species and communicable to man. Dogs, cats, and other animals are susceptible to the disease, and even the animals in a menagerie may be attacked. It affects chiefly the nasal mucous membrane which becomes highly inflamed. Ulceration soon follows accompanied by the discharge of thin matter, which soon becomes viscid, and an enlargement of the lymphatic, submaxillary glands. When the glandular trouble predominates the disease is termed FARCY (q.v.). An attack of glanders is sometimes preceded by general delibity, a rough appearance of the coat, difficulty of breathing, and loss of flesh and appetite. The characteristic discharge then appears and rapidly increases in quantity. The nasal membrane changes to a dull color and exhibits a dropsical appearance, and the ulceration spreads, frequently extending to the throat. Glanders is caused by the presence of a specific microbe, *Bacillus mallei*, in animals weakened by confinement in close and ill-ventilated stables the air of which becomes loaded with carbonaceous matter; also by improper feeding, excessive and long-continued labor with insufficient nourishment, exposure to storms, and general neglect and abuse. A horse that is apparently vigorous, may have Glanders in a chronic form, and if well fed and kept under the best possible hygienic conditions may live for many years and perform considerable labor, but a radical cure cannot be expected and he will always be a source of danger to all other horses with which he comes in contact and to everyone who feeds or uses him. A slight quantity of the nasal discharge coming in contact with any of the mucous membranes or with an abraded portion of the skin, is very sure to communicate the disease to man or to any of the equine race. On account of the malignant and contagious nature of the disease the use in the public streets of horses suffering with glanders is, in many places and should be in all, prohibited by law. As soon as glanders is suspected, the affected horse should be separated from others and handled with the greatest care until the real nature of his malady has been determined. When a positive diagnosis of glanders is made, unless the animal can be absolutely isolated, in order to enable a trial of mallein—the antitoxin of the disease—to be made, he should be shot and the carcass should be burned. The scientific name for glanders is EQUINIA (q.v. for a description of the disease as it occurs in man.)

GLANDS, n. plu. *glănd*z [OF. *glande*, a kernel: F. *gland*, an acorn—from L. *glandem*, an acorn]: organs of manifold forms and structure which perform the functions of secretion, or when ductless are believed to modify the composition of the blood—found in all parts of the body; small sap-receptacles in plants. GLANDER, v. *glăn'dėr*, to affect with glanders. GLAN'DERING, imp. GLAN'DERED, pp. *-dėrd*. GLANDERS, n. *glăn'dėrz* [OF. *glandre*, a swelling of the glands]: a disease of horses, generally affecting the lungs and mucous membrane of the nostrils, in which foul

matter runs from the nose (see above). GLAN′DERED, a. *-dėrd*, affected with glanders. GLAN′DULAR, a. *-dū-lėr*, containing glands; consisting of or pertaining to glands; in *bot.*, applied to hairs having glands at their tips. GLAN′DULARLY, ad. *-lĭ*. GLAN′DULA′TION, n. *-lā′shŭn*, the situation and structure of the secretory vessels in plants. GLAN′DULE, n. *-dūl*, a small gland or secreting vessel. GLAN′DULIF′EROUS, a. *-lĭf′ėr-ŭs* [L. *fero*, I carry]: bearing acorns, or fruit like acorns. GLAN′DULOUS, a. *-dū-lŭs*, consisting of or pertaining to glands.

GLANDS, in Anatomy: organs divided into two great classes, viz., true secreting glands, and ductless glands.—The first class constitute special organs for the production of the chief secretions; e.g., the lacrymal, mammary, and salivary glands, the liver, pancreas, kidneys, etc., while the suprarenal capsules, the spleen, the thymus, and the thyroid belong to the second class. It is believed, however, that some of the glands with visible secretion, the male reproductive glands for example, may also elaborate an internal secretion, taken from the glands by the blood and serving some useful, but as yet undetermined, purpose in the organism.

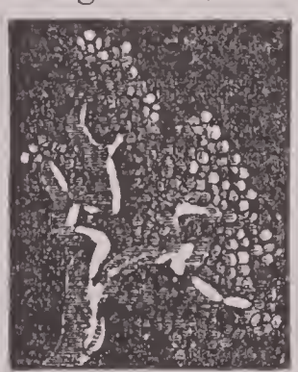


Fig. 1.—Lobule of Parotid Gland of an infant: Filled with mercury, and magnified 50 diameters.

An ordinary secreting gland consists of an aggregation of follicles all opening into a common duct by which the glandular product is discharged. The follicles contain in their interior, cells (q.v.), the active agents in the secreting process; while their exterior is surrounded by a net-work of capillaries, from whose contents the materials of secretion are extracted.

The simplest form of a gland is the inversion of the surface of a secreting membrane into follicles, which discharge their contents upon it by separate mouths. Of this we have examples in the gastric glands and follicles of Lieberkühn (see DIGESTION). The commencement of the progressive complication observed in most of the glandular structures occurring in man and the higher animals is illustrated in the accompanying diagram from Carpenter (fig. 2), where A represents a portion of the proventriculus of a falcon, in which follicles formed by simple inversion occur, while B represents a gastric gland from the middle of the human stomach, and C a still more complicated form, produced by the follicles doubling upon themselves, taken from near the pylorus. The articulata (e.g., insects) present glandular structures which can be traced and understood more easily than the glands of vertebrate animals; and the forms, in all of which a large amount of secreting surface is presented in comparatively little space, are often very graceful. In the group shown in fig. 3, the first two represent different forms of salivary glands, the third is a reproductive gland,

while the fourth and fifth are glands yielding the acrid matter which some insects secrete.

To understand the structure of a complex gland like the liver or kidney, it must be followed from the simplest form in which it is known to occur, through its various degrees

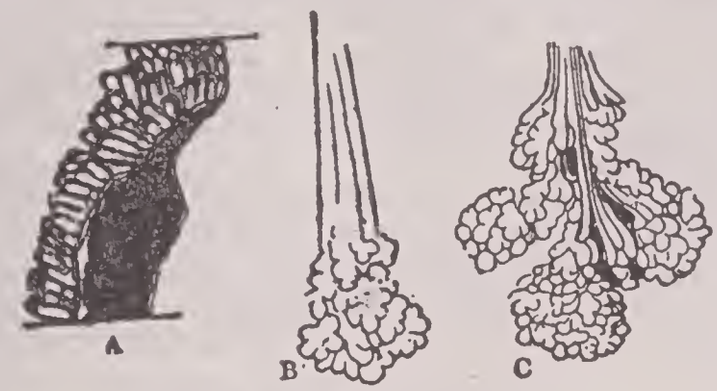


Fig. 2.

of complication. In this way the liver may be traced, from the lowest mollusca (where it exists as simple follicles, lodged in the walls of the stomach, and pouring their product into its cavity by separate orifices) up to man, in whom it is an organ of extreme intricacy; and similarly in

Fig. 3.

1, Part of the salivary gland of Nepa cinerea (after Ramdohr); 2, salivary vessel of Cicada ormi (after Succow) 3, testes of Staphylinus maxillorus; 4, secreting gland of Chlænius velutinus; 5, secreting gland of Calathus fulvipes.

the early fetal state of the higher animals, the liver and other secreting organs more or less resemble the persistent state of those parts in beings lower in the animal scale. In the same way, the mammary gland (q.v.), a structure of considerable complexity in the higher mammals, presents a

very simple arrangement in the lowest type of this class, the ornithorhynchus, in which it is merely a cluster of blind follicles, each discharging its contents by its own orifice. Sometimes a gland has several ducts (e.g. the lacrymal gland), but, as a general rule, the most important glands have only a single canal, formed by the union of the individual ducts, which conveys away the product of the secreting follicles. Whatever be the complexity in the higher animals, these elements are always found to resolve themselves into *follicles* or *tubuli*, which enclose the true secreting cells.

The second class of glands resemble the secreting glands in external conformation, and in the possession of a solid parenchymatous tissue, but differ from them in the absence of a duct or opening for removal of the products of secretion. In all of them, the tissue consists mainly of

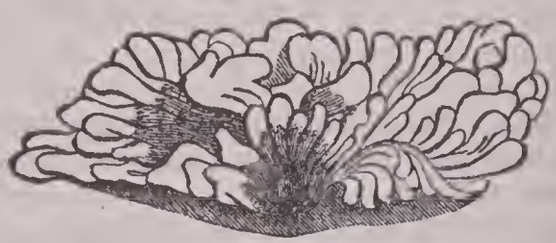


Fig. 4.—Mammary Gland of Ornithorhynchus.

cells and nuclei, with great abundance of blood-vessels. They may probably be regarded as appendages to the vascular system; and from the absence of any excretory duct, they have received the name of *ductless glands*.

For the *Lymphatic Glands*, a different class of structures: see LYMPHATIC SYSTEM.

GLANDULAR FEVER: an acute infectious disease affecting children for the most part, though adults, when exposed, are not always immune. In about a week after exposure to the disease, the symptoms begin with headache and pain in the neck; there is fever, the tongue is coated, the appetite is lost, and there may be nausea and vomiting. The pain in the neck is increased by movement and by swallowing. There is tenderness on pressure in the neck, especially the anterior portion, but no swelling is present in the early stages of the disease. There may also be tenderness on pressure over the abdomen, and the liver and spleen may be enlarged. After a few days a swelling makes its appearance at one side of the neck, usually the left, toward the front; less frequently the enlarged glands, for such the swelling is, may be located at the back of the neck, in the axilla, in the abdomen, or in the groin. The disease usually lasts about two weeks, during which time successive groups of glands become involved. As the swelling subsides (the glands seldom suppurate), the temperature begins to fall, and convalescence sets in. This latter is slow, and the child may be left weak and anemic for a considerable period. The treatment consists in measures to relieve the pain, which may be considerable,

and ensure sleep, and to maintain the strength as well as may be, until the disease subsides spontaneously.

GLANS, n. *glănz* [L. *glans*, any acorn-shaped fruit (see GLAND)]: in *bot.*, applied to the acorn or hazel-nut, and suchlike fruit, which are inclosed in bracts; the nut-like extremity of the penis.

GLANVIL, *glăn'vĭl* (or GLANVILL, or GLANVILLE), RANULPH DE: born Stratford, in Suffolk; died 1190: chief justice of England in the reign of Henry II; earliest writer on English jurisprudence. Of his work *Tractatus de Legibus et Consuetudinibus Angliæ*, Prof. Robertson says (*Hist. of Charles V.*), that it is supposed to have been the first undertaking of the kind in any country in Europe. Glanvil either wrote or superintended this work, about 1181. Lord Campbell (*Lives of the Chief-Justices*, i. 25) remarks that Glanvil, in some points, is still of authority, 'and may be perused with advantage by all who take an interest in our legal antiquities. This author is to be considered the father of English jurisprudence. Bracton, who writes in the following century, is more methodical, but he draws largely from the Roman civil law, and is often rather speculative; while Glanville actually details to us the practice of the Aula Regis in which he presided, furnishes us with a copious supply of precedents of writs and other procedure then in use, and explains with much precision the distinction and subtilities of the system which, in the fifth Norman reign, had nearly superseded the simple juridical institutions of our Anglo-Saxon ancestors.' This work was printed first in 1554. It closely resembles the Scottish *Regiam Majestatem* (q.v.). 'The latter,' says Coke, (*Inst.* iv. 345), 'doth in substance agree with our Glanville, and most commonly *de verbo in verbum*, and many times our Glanville is cited therein by special name.' A dispute has arisen, in consequence of this close similarity, as to which country shall claim the original work. Mr. Erskine does not hesitate to claim the distinction for Scotland; but Lord Stair, following the opinion of Craig, frankly admits 'that those books, called *Regiam Majestatem*, are no part of our (Scottish) law, but were compiled for the customs of England, in 13 books, by the Earl of Chester, and by some unknown and inconsiderate hand stolen thence, and resarcinate in those four books which pass amongst us' (Stair, i. l, s. 16).—Glanvil founded Butterley Abbey 1171. With other Yorkshire barons, he opposed William the Lion, king of Scotland, who invaded England 1174, and he took that king prisoner at Alnwick. He became chief-justice 1180. He died at the siege of Acre.

GLARE, n. *glär* [Norw. *glora*, to shine: Dut. *gloren*, to glimmer: Swiss, *glare*, to stare]: a bright dazzling light; overpowering lustre; a fierce piercing look: V. to shine with a dazzling light; to look with fierce piercing eyes. GLA'RING, imp.: ADJ. shining, so as to distress the eyes; clear; notorious; barefaced. GLARED, pp. *glärd*. GLA'RINGLY, ad. *-lĭ*, openly; notoriously. GLA'RINGNESS, n.—SYN. of 'glare, v.': to flare; flash; flicker; glitter.

GLAREOUS, a. *glär'ĭ-ŭs* [F. *glaireux*, slimy, mucous—(see GLAIR)]: resembling the white of an egg.

GLASGOW, *glăs-gō:* the metropolis of Scotland, and, next to London, the most populous city in all Great Britain. It is on the Clyde, in the lower ward of Lanarkshire, and occupies chiefly the n. side of the river, but has large and populous suburbs on the s. side. The river here is crossed by ten bridges, two of which are railway viaducts. Some of them have been recently rebuilt. Below the bridges ferry-boats ply at all hours. There is likewise a tunnel under the river for the accommodation both of pedestrian and vehicular traffic.

The ground upon which Glasgow is built is mostly level, but in the n. and n.w. districts are considerable elevations. Owing to the number of cotton-factories, chemical works, foundries, and workshops of all kinds, the city has a somewhat dingy and smoky aspect. In other respects, it has many attractions. The houses facing the river stand well back, leaving spacious thoroughfares on each side, and affording full and noble views of the bridges, of several handsome street ranges and public buildings, and of the harbor with its forests of masts and steam funnels. Most of the leading streets run from e. to w., parallel with the river, and almost all the streets, except in the oldest parts of the city, are straight. The houses are generally lofty, and built of freestone, the several floors of each tenement being frequently occupied by separate families, entering by a common stair. In the fashionable quarters, 'self-contained' houses prevail. Glasgow has comparatively few squares or other open spaces; the largest of these are the Green (140 acres); Queen's Park (more than 100 acres); Kelvingrove, or West End Park (40 acres); Alexandra (85 acres); Cathkin Park, gifted by James Dick (49 acres); Ruchill Park (53 acres); Bellahouston Park (185 acres); Tollcross Park (83 acres); Richmond Park (44 acres); Springburn Park (76 acres); Maxwell Park, (21 acres); Rouken Glen Park, (136 acres); Botanic Gardens with extensive ranges of hot-houses and green-houses (1891–1901) 50 acres. Mr. Cameron Corbett has also gifted to the citizens the mountainous estate of Ardkinglas in Argyllshire, containing upwards of 14,000 acres.

Glasgow had its nucleus first in the cathedral, afterward in the university. The former is situated in the n.e. of the city on a height on the banks of the Molendinar stream which flows between the old burying-ground and a steep rocky eminence formerly known as the Fir Park, now transformed into the Necropolis, a modern cemetery studded and crowned with monuments. From this ravine the name of Glasgow is supposed to have been derived, etymologists professing to find in it two Celtic words signifying a 'Dark Glen.' St. Kentigern, or St. Mungo, founded a bishopric on the banks of the Molendinar about 560; but for more than 500 years afterward the history of the

place is a blank. About 1115 David, prince of Cumbria (afterward king of Scotland), restored the see, and appointed his preceptor, John, to the bishopric, who laid the foundations of a cathedral, which was replaced by the present pile founded by Bp. Jocelin 1181. In 1180, King William the Lion erected Glasgow into a burgh, with the privilege of an annual fair; but for a century and a half later, it continued an insignificant town of not more than 1,500 inhabitants. In 1345, Bp. Rae built the first stone bridge across the Clyde; and 1451 Bp. Turnbull established the university, having obtained a bull for that purpose from Pope Nicholas V. The latter event gave considerable impetus to the place; yet, 1556, Glasgow ranked only 11th in importance among the towns of Scotland.

The city as it now exists is almost wholly modern, having quintupled in dimensions during the last 70 years. This immense growth has arisen from its situation in a district abounding in coal and iron, and from the facilities afforded by the Clyde for a world-wide commerce. At the same time much of its prosperity is due to local ingenuity and enterprise. Here, James Watt, 1765, made his memorable improvement on the steam-engine; here Henry Bell, 1812, first (in the old world) demonstrated the practicability of steam-navigation. An enormous sum has been expended on the widening and deepening of the river, now navigable by vessels 300 ft. long, and drawing 23 ft. of water. The Queen's Docks at Stobcross, opened 1877, have a depth of 20 ft. of water, and an area of 34 acres, and have cost £1,600,000.

The manufacturing industries of Glasgow, including also those of the surrounding and dependent districts, are unequaled for variety by any manufacturing town in the kingdom, with the exception, perhaps, of London. Among the older industries of importance are those connected with cotton, linen, and wool, including spinning and weaving, dyeing and bleaching, calico printing, and Turkey-red dyeing in particular. But the Glasgow of to-day is most largely dependent on iron and coal, and the importance of its textile industries is relatively less than formerly. It is the leading market for the whole iron production of Scotland, and there are blast furnaces and collieries within the city boundaries. The most important industry is ship-building and the connected trades, the Clyde, which was the birthplace of steam navigation in Europe, having ever since been closely associated with the growth and development of steam ship-building and marine engineering. Some 300,000 tons of shipping are usually built yearly. The commerce of Glasgow is commensurate in extent with the importance of its manufactures, and is closely associated with these. The value of foreign and colonial produce imported annually amounts to $80,000,000; that of the home produce exported, about $110,000,000. Large imports of tea, cotton, and other produce are received coastwise from London and Liverpool.

All the leading banks of Scotland are represented in Glasgow by numerous branches, and the Union Bank of Scotland and the Clydesdale Bank have their head offices here, as also have some insurance companies.

Pre-eminent among edifices stands the Cathedral, Glasgow's only ancient building, on the edge of a ravine separating it from the Necropolis (the chief public cemetery). It is a large Gothic edifice in the early pointed style with tower and spire rising from the centre, but without transepts; length of interior, 319 feet; width, 63 feet; height of nave, 90 feet; of choir, 85 feet; spire, 225 feet. It is especially distinguished for the beauty of its crypt, which is one of the most beautiful in Great Britain. The cathedral as it at present stands is supposed to have been begun before 1197, and completed within the 15th century. The chancel is used as a parish church, and the structure is under the charge of the government. Many of the other churches are marked by a high degree of architectural merit. Among other buildings are those of the university opened in 1870, and covering about four acres of ground, on Gilmorehill, a magnificent site overlooking the Kelvingrove Park. The main building is an oblong rectangular pile in the Collegiate Gothic style of the 14th century, about 600 feet long by 300 broad, divided into two quadrangles of 180 feet square, united by a centre building, and having a tower and open-work spire about 300 feet high. Another edifice of similar importance is the municipal building or city chambers, accommodating various departments connected with the corporation. This is an imposing structure in the Italian or Renaissance style, occupying a large area, and filling up the whole side of George Square. Other buildings abutting on the same square are the Bank of Scotland, and Merchants' House. Among other buildings are: The United Free Church College, a building in the Italian style with a high tower; the Royal Exchange, in the Corinthian style surmounted by a circular clock tower; the Stock Exchange, in the Venetian Gothic style; the Athenæum buildings, the Deaf and Dumb Institution, the Christian Institute, the Royal, the Western, and the Victoria infirmaries, the St. Enoch Station and Central Station hotels, the buildings of Glasgow and West of Scotland Technical College, the Procurators' Hall, etc. In George Square are statues of Queen Victoria, Prince Albert, James Watt, Lord Clyde, Robert Burns, Dr. Livingstone, Sir John Moore, etc., and a tall fluted Doric column surmounted by a statue of Sir Walter Scott. Elsewhere there are also equestrian statues of King William III. and of Wellington, besides an obelisk to Nelson in Glasgow Green, etc.

The educational institutions after the Glasgow University (q.v.) are St. Mungo's College; Anderson's College Medical School (founded 1796); the United Free Church College (for divinity students); the Glasgow and West of Scotland Technical College; Queen Margaret College for women, connected with the university; the Glasgow Aca-

demy and the Kelvinside Academy; the normal institutions of the Established Church and United Free Church; Allan Glen's School connected with the Technical College; the Glasgow School of Art; School of Music in connection with the Athenæum; and the Veterinary College.

The principal libraries are the University Library (220,000 vols.), the Mitchell Free Library (175,000 vols.), the libraries of the Faculty of Physicians and Surgeons and of the Faculty of Procurators, the combined Glasgow and Stirling's Libraries (45,000 vols.), Baillie's Library (22,000 vols.), etc. The Public Libraries Acts were adopted and Andrew Carnegie gave $500,000 for the establishment of district libraries.

The town council consists of 78 councilors, elected by 26 wards, and of the dean of Guild (elected by the Merchants' House) and the deacon-convener of the trades (elected by the Trades' House), as ex officio members. The lord-provost, 14 bailies, a river bailie, deputy bailie, a treasurer (honorary), and a master of works (honorary), are chosen from among the councilors.

The Caledonian, the North British, and the Glasgow and Southwestern railways have each one or more stations in Glasgow; the latter line is now accommodated, with the City Union railway, in the vast St. Enoch Square station. The Caledonian has lately built a large central station in Gordon Street; and the North British also has added largely to its accommodation. There are tramways in the principal lines of street. Pop. about 875,000.

GLAS'GOW, University of: founded 1451 by Bp. Turnbull, who procured a bull of ratification from Pope Nicholas V. In 1460, James, first Lord Hamilton, endowed a college on the site—in the densest part of the High Street—of the late buildings, the older portions of which were erected 1632–56. Queen Mary bestowed on the univ. 13 acres of adjacent ground. In 1577, James VI. granted increased funds in a new charter. In 1864, the univ. buildings and adjacent lands were sold, and handsome new buildings, designed by Sir G. Gilbert Scott, were erected at Gilmore hill, overlooking the West End Park, and opened 1872. The total cost was about £470,000, of which £120,000 were granted by parliament, and above £165,000 were subscribed, chiefly in Glasgow. The Marquis of Bute built a chapel 1878.

Chairs, Office-bearers, Degrees.—The office-bearers are chancellor, rector, principal, and dean of faculties. The chancellor holds his office for life, and was formerly elected by the senate, but since 1875 he is elected by the general council; the rector is elected triennially by the matriculated students, who are divided, according to their place of birth, into four nations—*Glottiana* (Lanarkshire), *Transforthana* (Scotland n. of the Forth), *Rothseiana* (Buteshire, Renfrewshire, and Ayrshire), *Loudoniana* (all other places). The Dean of Faculties is elected annually by the senate. The duties of chancellor and rector are chiefly honorary. The

chairs are Latin, Greek, mathematics, logic, natural philosophy, moral philosophy, English language and literature, anatomy, physiology, materia medica, practice of physic, natural history, chemistry, clinical surgery and medicine, midwifery, botany, surgery, medical jurisprudence, institutes of medicine, Oriental languages, divinity, church history, biblical criticism, civil law, conveyancing, civil engineering, and practical astromony. The degrees granted are master of arts, bachelor of science, doctor of medicine, master of surgery, bachelor of divinity, bachelor of law, bachelor of laws, doctor of divinity, and doctor of laws, the last two honorary. The ceremony of graduation was of old conducted with no little pomp through all its stages, from its beginning in what was called 'the Black Stone Examination,' to its close in the act of 'Laureation' in the College Hall, or one of the city churches. The number of students in attendance each year is about 2,000.

Bursaries and Exhibitions.—There are nearly 190 bursaries for students still attending lectures, ranging in value from £6 to £80; and of exhibitions, fellowships, and scholarships (besides 9 common to Glasgow with the other Scottish universities) there are 40. Of the latter the most valuable are the four Clark scholarships, founded 1872, and each worth £200 a year. The oldest are the Snell exhibitions, founded by John Snell, native of Ayrshire, who 1677 presented to the univ. a landed estate, for supporting at Balliol College, Oxford, 10 students who had previously studied at Glasgow. Owing to the rise in the value of land, the foundation now maintains 14 exhibitioners, who each receive £110 a year for five years.

Libraries, Museums, etc.—The library, founded prior to the reformation, now contains about 220,000 vols.: it is supported by an annual grant of £707 from the treasury, graduation fees, contributions of students, etc. Subsidiary libraries are attached to several of the classes, the books being selected with a view to the subjects treated of in each class. In 1781, July, the celebrated Dr. William Hunter of London framed a will, leaving to the principal and professors of the univ. his splendid collection of coins, medals, and anatomical preparations; and for the accommodation and conservation of these, a building was erected 1804, but they are now located in the new univ. The univ. has an observatory and a botanical garden, and several of the professors have collections of apparatus attached to their classes, illustrative of the courses delivered.

GLASS, n. *glăs* [Dan. *glas;* Ger. *glas*, glass: Norw. *glas*, a window; *glisa*, to shine through: F. *glacé*, polished, shining: Gael. *glas*, pale-green: L. *glacies*, ice]: hard, brittle, transparent substance, made by fusing powdered flint or fine sand with some alkali; a small drinking-vessel; the quantity contained therein; a mirror; an hour-glass—a measure of time; a draught of a liquid; a scientific instrument, as a *prospect-glass*, a *weather-glass:* ADJ. made of glass: V. in *OE.*, to see as in a glass; to case in glass; to

glaze or cover with vitrifying matter. GLASS'ING, imp. GLASSED, pp. *glăst*, cased in glass. GLAS'SY, a. *-sĭ*, made of or resembling glass. GLAS'SILY, ad. *-lĭ*. GLAS'SINESS, n. *-nĕs*. GLASS'FUL, n. *-fûl*, as much as a glass will hold. GLASS-BLOWER, one who makes glass vessels. GLASS-FURNACE, a furnace in which the materials for glass are fused. GLASS-HOUSE, a place where glass is made; a house made of glass. GLASS-PAPER, or GLASS-CLOTH, made by powdering glass, and sprinkling it over paper or calico still wet with a coat of thin glue: the powdered glass adheres as it dries. It is sold in sheets, and used in polishing metal and wood-work. GLASS SPONGE, kind of siliceous sponge whose spicules are prolonged into a strand of flexible glassy threads. GLASS-WORKS, a place where glass is made. HOUR-GLASS, an instrument made of glass for measuring an hour or other portion of time by the running out of dry sand from one compartment into another. GREEN OR BOTTLE GLASS, a coarse semi-transparent glass made of the silicates of alumina, iron, magnesia, and potash or soda. FLINT-GLASS, a silicate of potash and lead. WINDOW-GLASS, a silicate of soda and lime. PLATE-GLASS, a silicate of potash and lime. MUSCOVY-GLASS, *mŭs'kŏ-vĭ-*, mica. CROWN-GLASS, glass formed in large circular plates or disks, used as common window-glass. STAINED-GLASS, glass in which the coloring matter is mixed with the glass while in a state of fusion. GLASERITE, n. *glăs'ėr-īt*, a sulphate of potash, occurring in delicate white or yellowish-white crystallizations sublimed around the fumeroles of active volcanoes.

GLASS: essentially a combination of silica with some alkali or alkaline earth, such as lime, barytes, etc. Generally speaking, it is understood to be a silicate of soda, or a combination of silica or flint with one or more of the salts of sodium, with the addition of certain metallic oxides, etc.

History.—The invention of glass dates from the earliest antiquity, and the honor of its discovery has been contested by several nations. As the oldest known specimens are Egyptian, its invention may with great probability be attributed to that people. It is mentioned as early as the 5th or 6th dynasty, and called *bashnu*, the Coptic *bijni;* and articles made of it are represented in the tombs of the period; while its fabrication is depicted in sepulchres of the 12th dynasty—i.e., about B.C. 1800. An Egyptian specimen now in the British Museum has on its underside hieroglyphics giving the name Nuantef IV., whose date is assigned by Lepsius as B.C. 2423–2380. The glass of Egypt was generally opaque, rarely transparent, and always colored, the articles made of it being of small size, and principally for adornment as beads, vases, small figures, and objects for inlaying into wood or other material. Specimens exist of this glass bearing the name of the queen Hatasu of the 18th dynasty, B.C. 1445, and vases of blue glass with wavy lines in white, light-blue, yellow, black, red, and green of that and a later age, have been discovered. The Egyp-

tians also successfully imitated precious and other stones in glass—as emeralds, lapis lazuli, turquoises, jaspers, onyx, and obsidian; for this purpose, they used nearly the same materials as at present—manganese, copper, iron, cobalt, gold, and tin. Transparent glass, indeed, does not appear earlier in Egypt than the 26th dynasty, about B.C. 750, when bottles, and a few other objects—as figures for inlaying, and beads imitating gems—were made of it. According to Herodotus, the Ethiopians, two centuries later, placed their mummies in glass coffins; but the fact has never been proved by the discovery of such coffins.

Under the native Pharaohs, Egyptian glass seems to have been extensively exported to Greece and Italy, and its reputation continued under the Ptolemies, when the furnaces of Alexandria produced glass vases of numerous shapes and considerable size. At this period, the Egyptians invented the *millefiori* glass, consisting of small threads of glass arranged vertically and then fused, so that the whole rod thus formed was of one pattern; and by cutting off slices, each piece reproduced the same pattern. The beads of *madrepore* glass found in the tombs of Greece and Italy, and formed by placing slices of such rods in a mold and fusing the whole, are probably of Egyptian or Phœnician origin. Egypt retained the pre-eminence in the manufacture under the Romans, the sand of Alexandria being indispensable for the finest qualities, and it exported glass to Rome. Hadrian, on his visit, was struck with the activity of the manufacture, and sent to his friend, the Consul Servianus, one of the vases, called allosontes or 'opalescent;' and the Roman writers mention with admiration the melting, turning and engraving of Egyptian glass. To the most flourishing period of the empire are to be referred certain vases and slabs with white camei figures of fine execution in relief on a blue background, and plates of opaque glass for inlaying the walls of rooms, such as those which are said to have decorated the mansion of the usurper Firmus. The art of glass making, in fact, has never become extinct in Egypt, the Fatimite caliphs having issued glass coins in the 10th and 11th c., and beautiful lamps of glass enamelled on the surface with various colors having been made in the 14th c. Although the art has fallen to the lowest ebb in Egypt the workmen are said to show aptitude in its production.

After the Egyptians, the people of antiquity most renowned for glass were the Phœnicians, who were the legendary inventors. Certain of their merchants, it is said, returning in a ship laden with natron or soda, and having been compelled by stormy weather to land on a sandy tract under Mount Carmel, placed their cooking pots on lumps of natron on the sand, which, fused by the heat of the fire, formed the first glass. Sidon, indeed, was long celebrated for glass-wares made of the sand brought down from Mount Carmel to the mouth of the river Belus. The nature, however, of the earliest Phœnician glass is unknown, unless the opaque little vases of the

toilet found in the tombs of Greece and Italy, and the beads of the same discovered in the barrows and tumuli of the old Celtic and Teutonic tribes, were imports from the Phœnicians. The vases of Sidon were, however, highly esteemed at Rome under the Antonines, fragments of bowls of blue and amber glass with the names of the Sidonian glass-makers, Artas and Irenæus, stamped in Latin and Greek, having been found in the ruins. Perhaps the Assyrian glass vases were made at Sidon; at all events, the earliest stated specimen of transparent white glass is the vase having upon it stamped or engraved in Assyrian cuneiform a lion and the name of Sargon (reigned B.C. 722), found at Nimrud by Mr. Layard; and glass seems to have been imported to or even made in Assyria as late as the time of the Parthians, when Nineveh became the Roman colony of Claudiopolis. Under the Sassanides, molded glass vessels, elaborately decorated, were made, as is shown by the cup of Chosroes, A.D., 531–579, in the Louvre;

Fig. 1.—Glass Vase, Bearing the Name of Sargon, from Nimrud.

and Persia continued to manufacture glass vessels in the middle ages. The Arabs seem to have derived their glass from the Byzantines, and specimens introduced into Europe by the Crusaders were called in royal and other inventories Damascus glass; this was colored and not plain. Although the art of glass making appears to have been practiced in remote times this nation does not appear to have attained any proficiency in it, and is content at the present day to remelt European glass; while some of its highest efforts do not exceed the imitation of jade and other stones. There is still in the East an extensive use of glass beads, made chiefly at Khalib or Heron. Glass was equally unknown to the Hindus, except in the production of a few trinkets and inferior objects, till the settlement of Europeans in India; and the country was, at the remotest period, supplied by Phœnician, and, in the middle ages, by Venetian traders. Although Josephus claims the invention of the art for the Jews, no remains

of Jewish glass are known, and it is probable that the Jews were indebted for their supplies principally to the neighboring cities of Tyre and Sidon. Even in Greece itself glass was not ancient. In the days of Homer it was unknown. Herodotus, indeed, mentions its employment for ear-rings, but these may have been of Phœnician fabric. It was called *hyalos*, crystal or ice, and *lithos chyte* or fusible stone. Aristophanes, B.C., 450, mentions glass or crystal vessels, and various inscriptions confirm its use, but its value was next to gold, which could hardly have been the case if it had been of native manufacture. In the 4th C., B.C. Pausias, a celebrated painter, had depicted *Methe*, or 'Intoxication,' drinking from a transparent glass bowl which revealed her face. Glasses and plates, amphoræ and diotæ, large two-handled jars, were made of it, also false stones for finger-rings called *sphragides hyalenai*. These last, called by archæologists *pastes*,

Fig. 2.—Molded Glass Roman Cup, with the Circus and Gladiators found in London.

were imitations of engraved stones in colored glasses, used for the rings of the poorer classes, and were no doubt often copies or impressions of engraved stones of celebrated masters; false gems and camei having a subject in opaque white, sometimes like the sardonyx, with a brown layer superposed on the parts representing the hair, and the whole laid on a dark-blue ground, appear before the Christian era. Lenses also were made of glass, and the celestial sphere of Archimedes was of the same material. The supposed Phœnician colored glass vases for the toilet, found in the oldest sepulchres of Greece, it must be observed, have Greek shapes. Glass-makers *hyalopsoi hyalepsœ*, also are mentioned at a later period, there can be no doubt the art was practiced. Of the Alexandrian glass mention has already been made and the body of Alexander the Great was shown to Augustus in a glass coffin.

GLASS.

The glass-making art in Italy does not date earlier than the commencement of the Roman Empire, importations from Sidon and Alexandria having previously supplied the lack of native manufacture; but there is ample evidence of its extensive manufacture at that period having been introduced in the days of the Ptolemies, large plates being used for incrusting chambers, *vitreæ cameræ;* and hollow columns of this material, with lamps inside, were used to illumine the public theatres. As early as B.C. 58, the theatre of Scaurus had been decorated with mirrors or glass plates, disposed on the walls. Glass was used also for paving, and for the blue and green tesseræ of mosaics (see MOSAIC). Window-glass does not appear till about the 3d. c. after Christ, the houses at Herculaneum, destroyed in the reign of Titus, being glazed with talc and some doubt remaining as to the use of glass for this purpose at Pompeii. Lactantius in the 3d c. and St. Jerome, 422, mention glass windows. Older windows of this material are said to have been found at Ficulnea, and even in London. Under the Romans, colored as well as white glass was extensively used; it had a greenish tint in the first days of the Empire, but had sensibly improved in color and quality in the days of Constantine. The first production of a white glass like crystal was in the days of Nero. Its use was most extensive, and it was either blown or stamped according to the objects required. Glass vases, *vasa vitrea escaria potoria*, are mentioned. So are costly cups of many colors, purple ones of Lesbos, and balsamarii, especially the kind long called lachrymatories, which held perfumes, medicine, drugs, and other substances like modern vials, amphoræ, ampullæ, pillar-molded bowls, bottles for wine (*lagenæ*), urns (*urnæ*) for holding the ashes of the dead, and pillar-molded bowls or cups (*pocula*).

Besides these articles of amusement and luxury, hair-pins, beads, rings, balls, draughtsmen, dice, knuckle-bones (*astragali*), mirrors, multiplying-glasses, prisms, magnifying-glasses, telescopes, and water-clocks were made of this material.

Many vases are stamped, and some, principally of square shape, have the initials and devices of their makers, or contents (as eye-waters) impressed on the bottom. Most of the precious stones were successfully imitated in glass pastes; and Empress Salonina was egregiously cheated by a fraudulent jeweller. But the most remarkable works in glass are the camei vases (*toreumata vitri*); of which the most celebrated is the Portland vase in the British Museum, a two handled vessel about 10 inches high, of transparent dark-blue glass, coated with a layer of opaque white glass, which has been treated as a cameo; the white coating having been cut down, so as to give on each side groups of figures delicately executed in relief. The subject is the marriage of Peleus and Thetis, and the urn held the ashes of a member of the imperial family of Severus Alexander, who died A.D. 221–235, and who had

imposed a tax on glass. It was found in a magnificent sarcophagus in the Monte del Grano, near Rome. A vase of smaller size, but of similar fabric, with arabesques, found at Pompeii, is in the Naples Museum; and numerous fragments of even finer vases, some with five colors, are in different museums. In the reign of Tiberius, an adventurer pretended that he had invented flexible glass, and threw down a vase which only bent, and which he readjusted with a hammer; he seems to have connected it in some way with the philosopher's stone, and the emperor is said to have banished him or put him to death. This invention is said to have been twice reinvented in modern times—once by an Italian at the court of Casimir, king of Poland. In the 3d c. appeared the *diatreta* or 'bored vases,' consisting of cups (*pouela*) having externally letters, and net work almost detached from the glass, but connected by supports; all which must have been hollowed out by a tool, involving great labor. One vase of this class, bearing the name of Maximianus, (reigned 286–310), fixes their age. At a later period, bowls of engraved glass, having subjects of gladiatorial fights, came into use. Still later, apparently in the 5th c., a new style of glass ornamentation was introduced, consisting of the figures of Christ and legends of saints, and the portraits of private persons laid on in gold on one layer of glass, over which was placed another through which they appeared. At the close of the Byzantine Empire, the glass art was still rich and ornamental. Achilles Tatius describes a vase which, when filled with wine, made the portion representing the bunches of grapes seem red, as if ripened by the autumn. The numerous beads called serpents' eggs or adder stones (*glain nerdryr*), found throughout Roman Britain, were imported by route of Gaul to Britain, or made in Britain. Glass was cheap under the Roman Empire, and Strabo informs us that in his days in Rome a glass cup and saucer cost only an *as* (about a cent). Such articles, indeed, must have been of the poorest kind, as Nero is said to have paid 6,000 sesterces or about $250,000, for two cups of moderate dimensions. Aurelian made the Alexandrians pay a tax of glass. A peculiar white glass seems to have been made at Carthage under the Roman empire. Glass gems for rings (*vitreæ gemmæ*) were in extensive use. Glass, however, was considered always something costly and rare, and is mentioned as such in the *Revelations* and in the *Recognitions of St. Clement*, in which St. Peter is described as praying to see some marvellous columns of this material

Fig. 3.—Portland Vase.

in the island of Aradus. At the close of the Roman Empire only two kinds of glass appear to have been manufactured—bottles of greenish glass in the west, and the *hyalina diachrysa*, or gilded glass of many colors in the east. A few glass vessels of later date have been found in the Anglo-Saxon graves of England, and Frankish sepulchres of France, of a peculiar fabric of green glass, with projecting knobs, bent round to the body of the glass, and apparently a rude imitation of the *diatreta*. The Romans knew the use of soda and lead as fluxes for glass, and made both crown and flint-glass. They made most of the fancy varieties at present in use, and were acquainted with the art of coloring it blue by cobalt, green by copper, rose or ruby by gold. Many of their imitations of gems and other fanciful colors were also of *Schmeltz* glass. But the great site of the Glass manufactories of the dark and middle ages was Venice, whither it was transplanted on the foundation of that city in the 7th c. The art, however, seems to have improved on the conquest of Constantinople by the French 1204, and in 1291 the establishments were removed to the island of Murano, the manufacturers forming a guild with a libro d'oro, or register of nobility, and the secret kept with the greatest jealousy. In 1436, their color glass came into note, and continued so till the close of the century, and in the 16th c., lace-patterns and mirrors were introduced. In the 15th and 16th c., plain glass with nice ornaments gilt and enamelled; in the 16th, crackled lace and reticulated glass, *vitrodi trino;* and in the 17th c., variegated or marbled glasses were produced. The *millefiori* glass extends through all periods, and seems to have been derived from the Roman, being continued to the present day, when large quantities of it are annually imported to England, and transported to Africa and Asia in trade. The Venetian glass engaged for a long time the monopoly of commerce, their mirrors, goblets, and cups being exported all over the world, but it has been superseded by manufactures of England and Germany. The forms of the Venetian glass reflected its Oriental origin, and the earlier glass of other countries of Europe in their turn show the derivation of their art from Venice. In Germany the oldest glass (which was flint) dates from the 16th c., and consists of goblets and tankards of white color, enamelled with colored coats of arms and other devices, millefiori, and schmeltz glass. Engraved glass was introduced by Caspar Lehmann at Prague 1609, under imperial protection, and continued by his pupil G. Schwanhard; and ruby glass by Kunckel 1679. Glass is said to have been made 1294, at Quinquengrone, in Normandy, and before the 16th c., in the reign of Philip VI.; and John and the Dukes of Lorraine established manufactories in their domains, and a common kind was made in Dauphiny and Provence. Cast plate also is said to have been established at Cherbourg by artists from Venice, and 1688 the art was declared noble. Potash, lime, silica, and no lead was employed. Thevart introduced Glass casting and plate

glass works at Paris. In France, oxide of lead flint-glass was made at St. Cloud 1784; another manufactory was established at St. Louis 1790; and the St. Cloud establishment was removed to the vicinity of the Mont Cenis, where it flourished till 1827. It is uncertain whether glass was made in England before the 16th c., as that mentioned may have been imported from Flanders or Venice. Window-glass is mentioned by Bede 674, but was not in general use for windows till the 15th c. In 1557 flint glass was manufactured at the Savoy and Crutched Friars; 1565 there were

Fig. 4.—German Drinking-glass.

Fig. 5.—Venetian Glass on open-work stem.

glass-works under Cornelius de Launoy; and 1557 Jean Quarre and other Flemish manufacturers established works at Crutched Friars, which Quarre's descendants extended to Sussex. In 1615, Sir R. Maunsell obtained a patent for making glass, in consideration of using pit coal instead of wood, and oxide of lead was then introduced in 1635; and in 1673, Venetian artists, brought over by the Duke of Buckingham, manufactured mirrors of plate-glass at Lambeth, and drinking glasses mere made at this period. But Venetian glass was extensively imported. In 1771 the company of British plate-glass manufacturers

was established at Ravenhead, near Prescot, Lancashire; and 1728, plate-glass was made by the Cooksons at South Shields, and by the Thames Plate-glass Company 1835–6. Patent plate was made first 1840. In Scotland, the manufacture was introduced in the reign of James VI., and George Hay obtained a patent for 31 years. The first glass was manufactured at Wemyss, Fifeshire; afterward at Prestonpans and Leith. In 1661, only the principal chambers of the king's palace had glass. Glass manufacture is a great industry of the U. S., dating back to 1608, at Jamestown, Va. These works are said to have been destroyed in the massacre of 1622. In Massachusetts glass was made as early as 1639 at Salem, and in Pennsylvania in 1683. The industry spread, and in 1796 we find the first glass works west of the Alleghanies in operation at Pittsburg. Here coal as fuel was first used in glass manufacture in the U. S. The discovery of natural gas and its application to glass furnaces led to a very great increase in the building of flint and green-glass works throughout the Middle West. At Alton, Ill., what is probably the largest flint-bottle works in the world is located. It gives employment to nearly five thousand people.

At an early period the application of glass for magnifying lenses appears to have been known. Ptolemy II. had a telescope mounted at the Pharos, and globes filled with water were in use for magnifying under the Romans. Lenses are mentioned in the 12th c., by Alhazan, and by Roger Bacon in the 13th c., toward the close of which Salvino d'Armato invented eye-glasses, subsequently improved by Alessandro Spina. Glass reflectors for telescopes, of great size and accuracy, have been made in France: see TELESCOPE.

As regards processes of making, that called the cylindrical was used by the ancients, and is mentioned by Theophilus at the end of the 12th c. The rotatory process was introduced first in Bohemia, subsequently into France 1730, but not into England till 1832. Pressed glass was invented in America in 1827, at the Sandwich works in Massachusetts. It was used at first for common objects, but since 1870 a very fine quality has been produced.

Manufacture.—Before giving a sketch of the processes by which it is made, it will be well to notice the nature and kinds of glass. In its ordinary state, glass is a solid body with a characteristic lustre called vitreous, and a conchoidal or shell-like fracture when broken, best seen in pieces of some thickness; further, it is more or less brittle, a property which arises from its outer and inner molecules cooling from a state of fusion at a very unequal rate. It is usually said to be amorphous, but perhaps it rather represents a stage between the perfectly amorphous and the crystalline states. One of the things that a glass-maker dreads is a tendency in his glass to crystallize in cooling. Glass is commonly transparent, though this property is not essential, since a true glass may be almost opaque, or at most only translucent, when very thin.

GLASS.

The chemical composition of glass differs in the different kinds. It is essentially a silicate of soda or of potash combined with a silicate of some alkaline earth or other basic body, such as the oxide of lead. Silica with potash or soda alone, or with both, forms a soluble glass unfit for windows or vessels of any kind. The following table gives the composition of the chief kinds:

1. Window-glass, including crown, sheet, and plate: silicate of soda and lime.
2. Bohemian Crystal-glass: silicate of potash and lime. Some window-glass is of this composition.
3. Flint-glass, often called crystal-glass or simply crystal: silicate of potash and lead.
4. Bottle-glass, that is, of the common kinds: silicate of lime and alumina; with smaller quantities of the silicates of potash or soda, iron and manganese; the silicates of baryta and magnesia also being frequently present.

There are some other kinds made on a limited scale, such as optical glass, strass, and enamel glass. Any of the above kinds may be colored by the use of certain metallic oxides.

Raw Materials.—For the better kinds of glass, these are the following: *Silica*, employed chiefly in the form of sand, white and comparatively pure: sometimes for very pure glass rock-crystal is used instead of sand. *Potash*, as pearl-ash, or wood-ashes, or the sulphate of potash. *Soda* in the form of carbonate or sulphate of soda. *Lime* in the state of marble, chalk, or ordinary limestone, if sufficiently pure. *Baryta*, from heavy spar or witherite; but barium compounds are as yet used to only a limited extent. *Lead* is used most safely in the form of red-lead (peroxide), a quality free from copper, which would impart color, being specially made for glass-makers. *Cullet* or broken glass of the kind intended to be made. All the above materials must be as free as possible from iron or other impurities when colorless glass is required; and to prevent any iron or carbon present from tingeing the glass, small quantities of oxidizing agents, as nitre, arsenious acid, and peroxide of manganese also are employed. Bottle-glass is made of comparatively coarse materials, as will be presently seen.

Glass Pots or Melting-vessels.—These require to be very carefully made of some very refractory clay, since the cracking of one in the furnace, which sometimes happens when it is newly put in, is a considerable loss to the manufacturer. They are molded from a specially prepared and carefully kneaded pot-clay. It is almost wholly composed of silica and alumina with water, and is therefore nearly free from oxide of iron or other easily fusible ingredients. Much attention is given to the preliminary preparation of the clay, called tempering. The clay, already so far prepared for the purpose is received at a glass work in a state of powder. It is then put into large cisterns, mixed with water, and kneaded with the naked feet, which renders the clay of a uniform consistency and free from air

cavities; but it requires to be turned over and kneaded repeatedly. After a week or two, it is removed to large tables, where it is mixed with the ground fragments of old melting-pots, and carefully worked into a plastic mass. This prepared clay is next made up into small rolled pieces, with which the pot-maker slowly builds up the pot, adding only a few inches to its height in a day. The pots are usually kept several months in stock, after which they are annealed by being kept for a few days at red heat, in which state they are transferred to the glass-furnace for use. New pots require to be 'glazed' by throwing in a quantity of broken glass, which protects them from the further action of the materials used in glass-making. Fig. 6 represents a pot for window or bottle glass, and Fig. 7 a flint-glass pot, which has always a covered top.

Fig. 6.

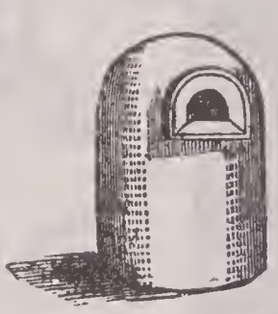


Fig. 7.

Furnaces.—The furnaces long in use for different kinds of glass will be noticed in turn under the respective processes; as, however, the Siemens furnace has now come into extensive use in various departments of the manufacture, it is necessary to give an idea of its construction. For a general description of it see STEEL: here is given a plan (Fig. 8), and a cross section (Fig. 9)—the latter showing the brick regenerators—of that form called the continuous tank furnace, in which no pots are used—a form as yet employed chiefly in making bottle-glass and rolled plate. For most kinds of glass, pots are still used in the Siemens as well as in the older kinds of furnaces; but where pots are preferred, the chief difference is that a flat platform is prepared for their reception, instead of the bed of the furnace being in the shape of a tank or cistern.

The figures are to some extent rather diagrams than exact representations of the furnace. In the plan (Fig. 8), RM is the compartment into which the raw materials are fed by the doors, D. When the glass is partially melted, it passes under the first floating bridge of fireclay, B, which keeps back floating impurities. In compartment P the glass is completely melted, and it then passes in a pure state under the second floating bridge, B′, into the compartment W, where it is ready for use; *h*, *h*, *h*, being the working holes. The space under RM in Fig. 9 is an air-flue for keeping the tank cool. In the section (Fig. 9), A and G represent the air and gas regenerators in the left, and A′ and G′ the corresponding ones on the right. The

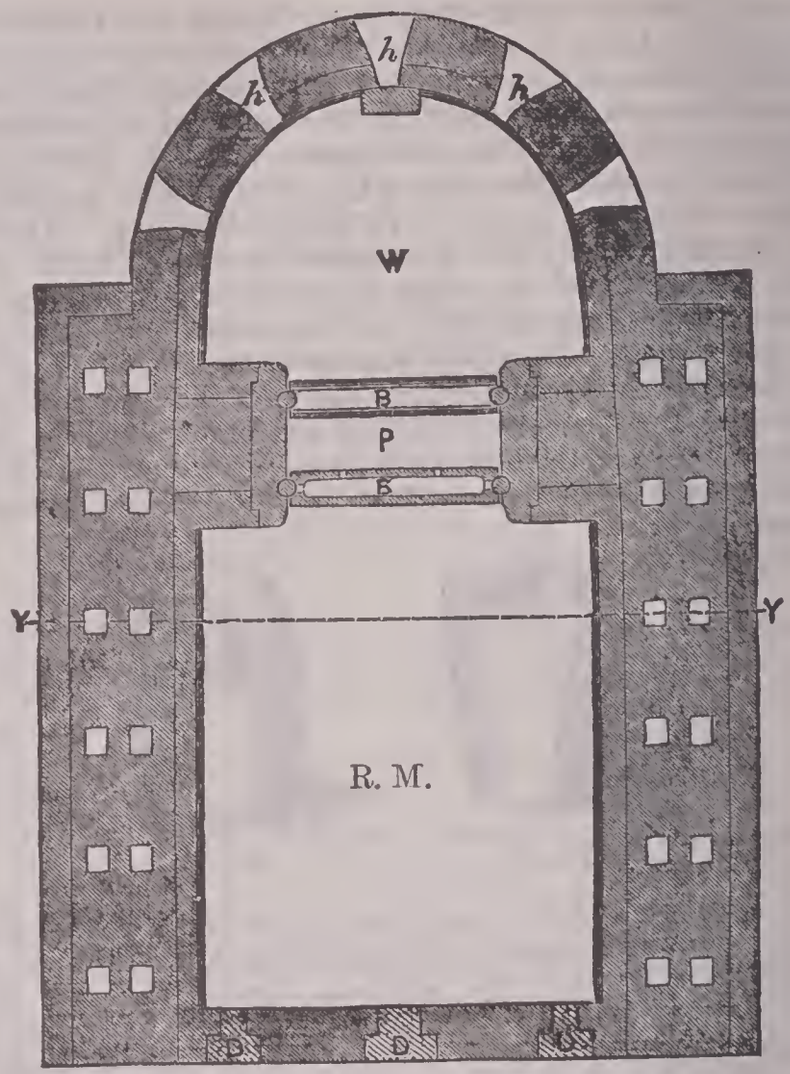


Fig. 8.

gas producers are not shown, but as explained under STEEL, the air and gas are fed for a certain time through

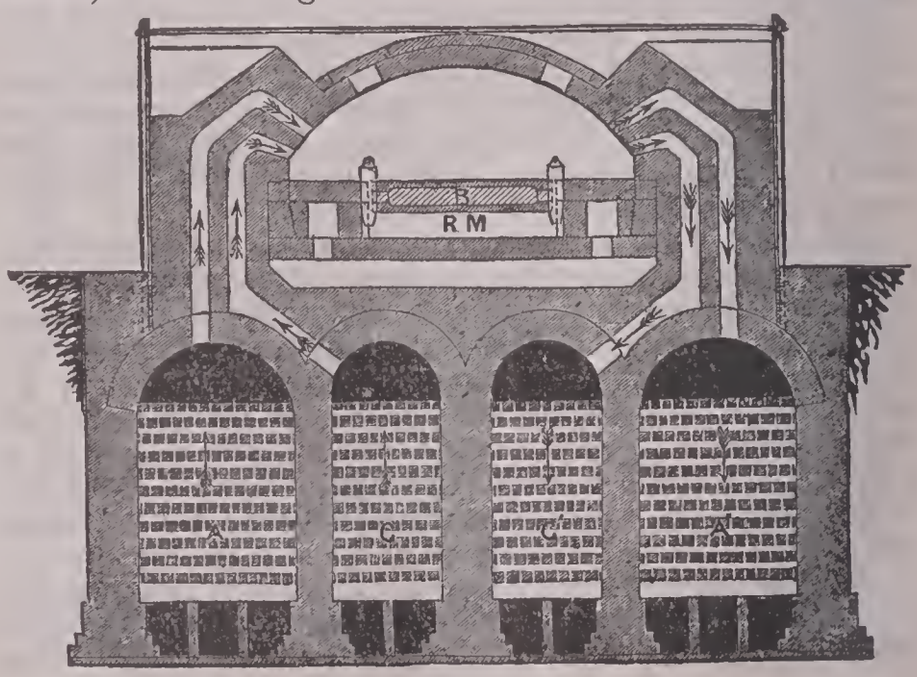


Fig. 9.

A and G respectively to the bed of the furnace; and while this is the case, the products of combustion descend through A′ and G′ on the right, by which the piles of open brick-work become in time highly heated. By a proper arrangement of flues and valves, this process is then reversed, so that the gas and air now enter the furnace on the right, robbing in their course the hot bricks in A and G of their heat, and carrying it back to the bed of the furnace. This time, of course, the products of

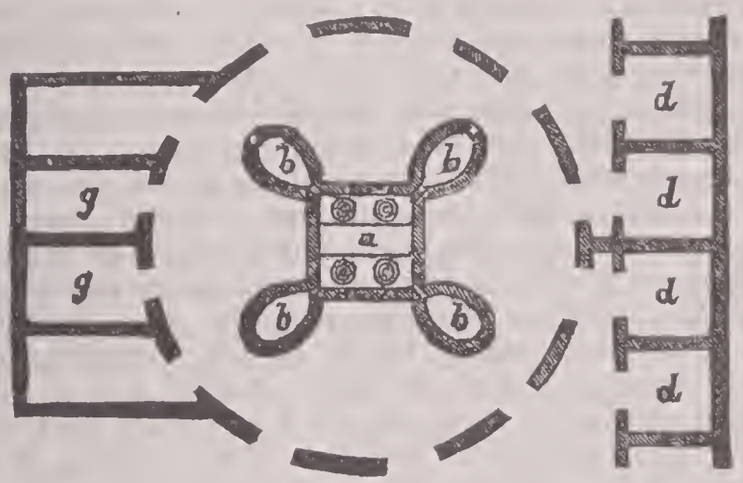


Fig. 10.

combustion escape through A and G on the left, by which these regenerators become in turn heated, thus saving heat which is lost by escaping up the chimney in ordinary furnaces.

Bottle-glass.—For the dark varieties, such materials as common sand, spent-lime from gas-works, soap-makers' waste, kelp-waste, brick-dust, marl, and broken glass (cullet) are used. For lighter-colored bottles, a purer sand and a whitish limestone, are substituted for dark sand and gas-lime, and manganese waste is added. In

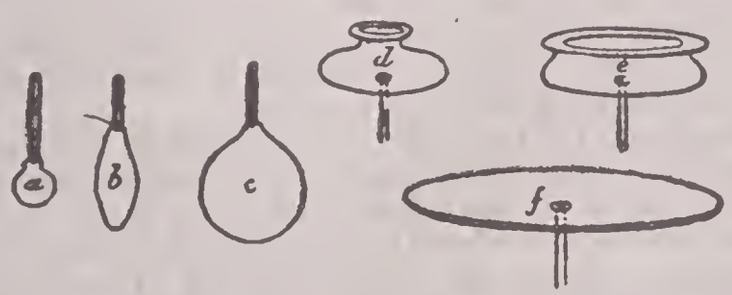


Fig. 11.

France a basaltic earth is used with other materials, and indeed these vary much with the locality of the glass-house. Fig. 10 represents a bottle-glass furnace of the old type, which, however, is now largely superseded by that of Dr. Siemens: *g*, *g*, and other similar apartments not shown, are stores for materials; and, *d*, *d*, *d*, are annealing arches. For bottle-glass the materials are first calcined in the arches, *b*, *b*, *b*, *b*, and afterward transferred to the melting pots, four of which are shown at *a*. When

the glass is properly melted and skimmed a workman dips a long iron tube called a blow-pipe into a pot, and takes up (on repeating the operation) a 'gathering,' or sufficient metal to make a bottle (*a*, Fig. 11). Another workman brings this into a pear-shape (*b*, Fig. 11) by slightly blowing and turning it on a stone or iron table, called a *marver*. Formerly, the further manipulation of the bottle was done by hand, but molds are now used. These are usually of cast-iron or brass, and open or close by the pressure of the foot on a spring. Into such a mold the partially distended glass is inserted, and made to fill it by blowing down the tube, the bottom being pushed up with a pontil, and the ring round the mouth afterward made by the addition of a strip of metal. In France, where the process of blowing differs in its details, clay molds are often used for champagne bottles, and some other kinds, in which case every bottle passes in succession through three molds, taking its perfect shape in the last.

Annealing.—When the glass-blower has finished a bottle, it is immediately taken to the annealing oven, where it remains about 36 hours, during which time it cools very gradually from almost a softening heat to the ordinary temperature of the air. This process is very important in the manufacture of all kinds of glass, because when newly made into vessels or sheets, it is so fragile that it will scarcely endure touching. The molecules are then under a strain from the outside portion of the glass cooling much quicker than the inner; but this is in a great measure rectified by annealing it, and so a proper strength is acquired.

Window-glass.—Crown and sheet-glass are the very same in respect to composition, and plate glass differs from them only in that the proportion of lime is usually less, and the materials more carefully selected for purity. In general, sheet-glass is made from mixtures of which the following is an example: Sand, 100; quicklime, 32; carbonate and sulphate of soda, 40; and cullet, 100 lbs.; small quantities of those bleaching or oxidizing agents already noted being added as required.

Crown-glass.—Of this, the manufacture is now largely given up in favor of sheet-glass, at first called German or Bohemian sheet. Crown-glass being in large circular disks, much waste is caused by cutting these into rectangular pieces, and by the thickened lump or bull's eye in the centre of the disk. In past days these objectionable bull's-eye pieces were stuck into cellar-windows, and it is a curious fact that these are now being made, though of smaller size and in colored glass, in large numbers for ornamental windows.

The metal being brought to a workable condition and skimmed a sheet of crown-glass is made in this way: A workman, by dipping his long iron blow-pipe two or three times into the pot, takes up on the end of it a gathering of about 10 lbs. of metal, which, when the tube is held up-

right, lengthens by its own weight into a bulb shape (*a*, Fig. 11). Rolling this on the marver, the workman makes the outer portion conical, and then, by blowing, forms it into a pear shape (*b*, Fig. 11). Further heating and blowing, in the intervals of which the gradually expanding bulb is rolled on a smooth iron bar, called a bullion-bar, brings it into the shape of a flattened sphere, and to a much increased size (*c*, Fig. 11).

At this stage the glass is transferred from the blowing-tube to an iron rod (pontil), on the end of which a little hot metal has been placed. What is called a casher-box is used to rest the blowing-iron upon, for the purpose of attaching the pontil to the opposite point of the oblate sphere. The tube is now detached by means of a piece of iron dipped in cold water (*d*, Fig. 11). The globe of glass is now held by the pontil. The operator next carries it to the nose-hole, and presents the opening formed by the detachment of the blow-pipe to the action of the furnace; this again softens the glass which is then taken to the flashing furnace, and kept continually revolving, by turning the pontil on a rest in front of the furnace opening. The revolutions are at first slow, but are gradually accelerated as the softening goes on, and the centrifugal force so produced throws the edges of the orifice outward as in *e*, Fig. 11. As the glass flattens, it is revolved with greater rapidity, and advanced so near to the mouth of the furnace as to draw the flames outward, by contracting the draught. This completes the softening of the glass, it then opens suddenly, with a rushing noise like the unfurling of a flag in the wind, caused by the rapid flying outward of the softened glass and the rush of the flames outward. It becomes perfectly flat, and of equal thickness, except at the bullion or centre, formed, as before described, by the bullion-bar and the punty. The *flashing* is now complete; and after being detached from the pontil, it is taken to the annealing oven, into which it is passed through a long horizontal slit which forms the opening, and when fairly in, it is dexterously turned on its edge. Here it remains at a temperature somewhat below that required to soften glass, until the oven is filled with these so-called *tables* of glass, when the heat is suffered to decline, until the whole is cold, when they are removed to the packing-room, to be packed in crates for sale.

Sheet or cylinder glass, as already stated, has now almost entirely displaced crown-glass for windows. The Bohemian process, at present practiced, was introduced from France though a very rude kind of sheet-glass had been before that time (1832), made in England. Sheet is made in a quite different way from crown-glass, inasmuch as a long and perfect cylinder is sought to be produced by the *blower* instead of a sphere of glass. This necessitates also a different arrangement of the glass-house, as is seen by the ground-plan in Fig. 12: *a a* is the furnace, *b* is the annealing oven, heated by the flue *b'*,

which opens into the main furnace; the *leer*, or annealing oven, is often, however, an independent structure; *c*, *c*, *c*, are the eight pots, the number usual in these works. These, of course, are opposite to the openings for working

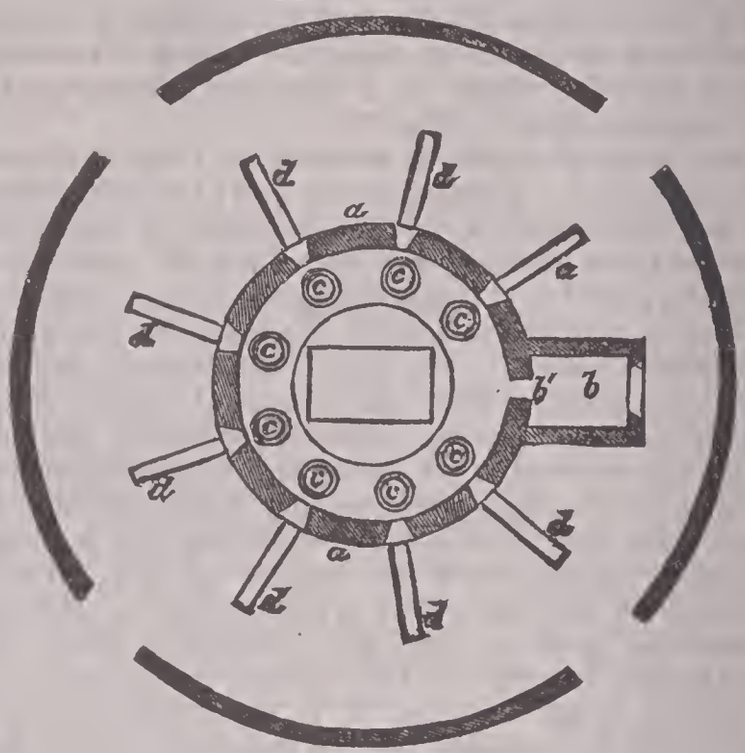


Fig. 12.

them, and in front of each opening is a long opening in the ground about eight ft. deep and three ft. wide, *d*, *d*, *d*. The workman stands on the edge of this pit, and having made his gathering (*a*, Fig. 13), he forms it into a cylindrical mass in the hollow of a block of wood, into which a stream of water is run. It is further manipulated by blowing and turning into this hollowed wood till it reaches the diameter required. By more blowing and swinging over the head, the workman brings it by degrees nearer to the form of an elongated cylinder (*c*, *d*, Fig. 13). As it

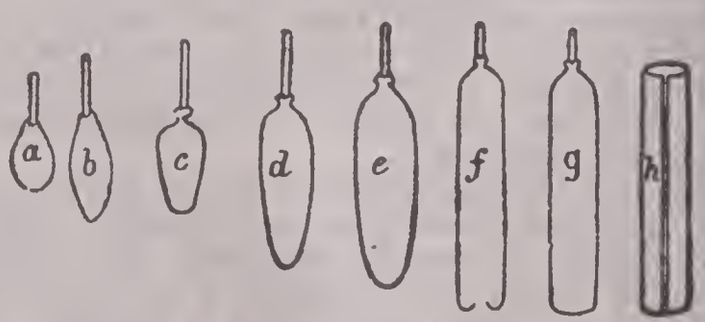


Fig. 13.

cools rapidly in this operation, he from time to time places his pipe in the rest before the furnace-mouth, and gently turning it round, he brings it again nearly to the melting-point; then he repeats the blowing and swinging, standing over the pit, to enable him to swing it completely round

as it lengthens out. These operations are continued until the cylinder has reached its maximum size—that is, until it is of equal thickness throughout, and sufficiently long and broad to admit of sheets, of the required size being made from it (*e*, Fig. 13). These cylinders vary in length, but are usually about five feet long, allowing sheets a little over four in length to be made from them. The Belgians were the first to make very large sheets. The next operation is to place the pipe in the rest, and apply the thumb so as to close the opening at the blowing end: the heat of the furnace soon softens the glass at the closed extremity of the cylinder, and as the inclosed air is prevented escaping, as it rarefies, by the thumb placed on the opening of the blow-pipe, it bursts at the softened part (Fig. 13, *f*); the operator then quickly turns the cylinder, still with its end to the fire, and the softened edges of the opening, which at first are curved inward, are *flashed* out until they are in a straight line with the sides of the cylinder (*g*, Fig. 13). It is then removed, and placed on a rest or casher-box, when just at the shoulder near the blow-pipe, the workman wraps round a thread of red-hot glass, which after a few seconds he withdraws and touching it quickly with his cold shears, the shoulder and neck drop off as neatly as if cut with a diamond. The removal of this neck of glass can be effected also by drawing a red-hot iron rod round the shoulder, and then dropping a little cold water on it. Formerly, the finished cylinder was cut open longitudinally by means of a red-hot iron rod.

The cylinder (*h*, Fig. 13) is now placed for a short time in the annealing oven (*b*, Fig. 12), where it is prepared for cutting; it is next placed in a groove lined with green baize, and a diamond fixed to a sliding rule makes a straight cut from end to end. The split cylinder is then taken to the *flattening* arch or furnace, where it is laid on the bottom, with the diamond-cut upward. The bottom is a smooth stone, kept constantly free from dust by the workman; here the heat is sufficient to soften without melting the glass, and the *flattener*, as it softens, opens the two edges of the crack until by its own weight the sheet falls flat on the stone; he then takes an implement in the form of a rake, made by placing a piece of charred wood transversely at the end of a long handle, and this is gently rubbed over the glass producing a very smooth surface. The annealing kiln is immediately at the back of the flattening arch, and the flattening stone mounted on a wagon and carrying the sheet of now flat glass is moved into the annealing chamber. Here, when cool enough to bear moving, the sheet is first placed horizontally and afterward with others piled upright. The wagon is in this way moved from one chamber to the other with successive sheets of glass till the annealing oven is filled. The oven is then closed so that it may be free from draughts and allowed to cool slowly down for a period varying from three to five days. Very much

larger sheets are obtained by this than by the crown-glass process.

Glass-shades are made in the manner above described; they are nothing more, indeed, than the rounded ends of the cylinders before being burst. When wanted oval or square, these forms are produced by the use of boxes of wood charred inside, of the size the shades are required, through which the cylinder is passed when being blown, until the soft glass touches, and receives shapes from the inside of the box or mold; they are afterward annealed, and cut to the lengths required.

Plate-glass is made in a totally different manner from crown or sheet. Great care is taken in the selection of the materials, as they require to be purer than for ordinary window-glass. From its thickness any impurity of color is readily noticed, and on account of its flat surface when polished, air-cavities are conspicuous defects. The sand requires to be as free as possible from iron, the staining power of which is usually corrected in the case of plate-glass by the addition of a little arsenious acid. Almost every manufacturer has his own private recipe for the mixture of materials, but the following is one said to be in use: Fine white sand well washed, 720 lbs.; sulphate of soda, 450 lbs.; slaked lime, 180 lbs.; nitrate of potash 25 lbs.; and cullet of plate-glass, 425 lbs. When melted and ready for use, the pot is lifted out of the furnace (*aa*, Fig. 14) by means of the forceps, and wheeled up to the casting-table (*cc*, Fig. 14); here it is seized by a crane and tackle, by which it is lifted, and so nicely poised over the table, that it can be easily tilted so as to pour out its contents. All this requires so much care and steadiness, that the men, impressed with the great danger of carelessness, usually keep perfect silence during their work. The table is of large size—20 ft or more in length, by 8 or 10 ft. in width. When the red-hot glass which is not in a very liquid state is poured on, it immediately begins to spread; two bars of iron, a little thicker than the plate is intended to be, are quickly laid on each side of the table, and a steel roller is laid across, resting on these bars: this roller is worked by hand, and rapidly spreads the glass all over the table, the bars preventing it from running over the sides, and regulating its thickness. In a very short time, it begins to cool; the men then seize the end of it with pincers, and pull it forward with great dexterity on to an endless band of wire-gauze, which, being made to revolve, moves the immense plate forward to a slit-like opening to the annealing oven (*f*, *f*, Fig. 14), where it is worked on to another table on wheels, which is pushed forward to make room for another. The annealing oven is usually of immense length, as, in the case of plate-glass the sheets cannot be set on edge. The ovens are in sheds, often two ovens to each shed; and the sheds more than 300 ft. in length. The ground plan in Fig. 14 gives a general idea of the arrangement of one of these vast workshops.

The main building is a shed, with the doors at each end; and both doors and windows are made so as to exclude draughts of air, which if admitted during the operation of casting, are highly injurious to the quality of the manufacture. *a*, *a*, are the two melting furnaces; *b*, *b*, *b*, *b*, *b*, *b*, the pots; *c*, *c*, the casting-tables; *d*, *d*, the endless bands of wire-gauze for moving the plates to the annealing ovens,

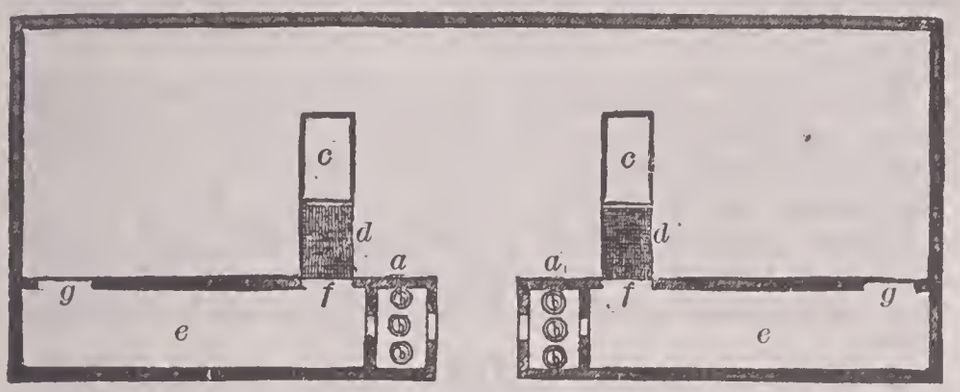


Fig. 14.

e, *e*, where they enter by the narrow openings *f*, *f*; and, after they have sufficiently cooled, are removed through the openings at each end, *g*, *g*.

The plates are next removed to the first polishing-shed, where each is imbedded in a matrix of stucco, leaving one surface exposed; the whole is inclosed in a frame, which holds both glass and stucco securely. Two of these frames are placed one over the other, with the two exposed surfaces of glass in contact. The lower frame is fixed, and the upper is made to move by machinery somewhat quickly backward and forward with a swinging motion, so as to describe an opposite curve with each backward and forward motion. Sand and water are continually thrown on the surface of the fixed plate, and thus the first stage of polishing, called grinding, is performed. The plates are then readjusted in the frames, and the other surfaces are brought face to face and receive a similar rubbing down with sand and water. The plates now receive a second grinding or rather smoothing on the same table with emery powder and water, the emery used being of increased fineness as the process proceeds. Formerly this was done by hand, the operators being women; now machinery is employed, and the finishing touches only are by hand. After both sides have received this smoothing, the plates are removed to another room, where they are again imbedded on tables which are movable by machinery, so that the whole surface of the plate may be brought under the action of the polishers. These are padded iron buffers attached to short iron rods passing through holes in a beam acted on by springs. The buffers are covered with leather, and rub the glass as it passes from side to side, the surface of which is supplied with oxide of iron in a very fine state of division and mixed with water. When any inequalities are encountered, the springs yield and allow

the buffers to pass freely over them. An older plan of polishing is to use wooden rubber-blocks covered with felt.

Rolled Plate.—About 1850 was introduced a very successful method of making unpolished plate-glass variously figured, which has been very successful. Sheets of this glass are made by ladling from the pots given quantities of glass and pouring them on casting tables which have reverses of the required patterns formed upon them. The process is adapted only for sheets of moderate size and thickness.

Patent Plate.—Sheet-glass made by the cylinder process, when free from flaws and of good color, is to a limited extent ground and polished much in the same way as ordinary plateglass, but is rather higher in price. However, its lightness is an advantage for some purposes, such as the glazing of picture frames and for photographic negatives. It is called patent plate to distinguish it from thick plate-glass.

Qualities of Plate-glass.—There is great difference in the quality of plate-glass from different manufacturers. We do not refer to air-cavities or other imperfections which can be readily seen, and from which the highest-priced glass, such as that used for mirrors, is almost free; but to a defect by which the transparency of the whole surface of the glass is impaired. It is often found, for example, that of two plates apparently equally pure and free from flaws, one will take on a peculiar dimness a few days after being cleaned, while the other will remain quite clear and transparent for as many weeks. Plate-glass, which does not keep long clean—to use a homely phrase—may often pass unnoticed for a long time until experience of a better quality calls attention to it. Some inferior qualities of 'pressed glass,' noticed below, also take on a kind of scum even when newly cleaned, a fault most readily noticed in plain articles.

Flint-glass is chiefly a silicate of lead and potash. Such a mixture as the following yields a good glass of this kind: 100 parts of pure white sand, 50 parts of pearl-ash, 100 parts of red-lead, 3 parts of borax, and a very little arsenious acid and peroxide of manganese. Cullet is usually added to the extent of about one-fourth part of the whole mixture. The pots for flint-glass (Fig. 7) are covered or hooded, so as to protect the melted glass from any impurities in the flames of the furnace. The materials used are very carefully selected, as the glass requires to be of great purity; the greenish tint in sheet or plate, due to the soda, would be very objectionable in flint-glass. Its brilliant flashing appearance, when cut into suitable patterns, is owing to its high power of refracting and dispersing light, a property arising from its comparatively high density. The working of flint-glass resembles in a general way that of the other kinds: the following list of the stages in making a wine-glass, gives an idea of the process to the point where the manipulation of the metal in a welding state finishes: 1. Gathering of metal; 2. Same marvered, and bowl

formed; 3. Glass with metal for stem dropped on; 4. Same with stem formed; 5. Same with foot stuck on; 6. Same with foot heated and half opened; 7. Same with foot opened, bowl cracked off, heated, and sheared: 8. Same finished. It is then annealed.

Optical Glass.—This is made both of flint and crown glass. In the case of lenses for a telescope, e.g., a combination of the two kinds is necessary to make it achromatic—their unequal densities giving them different refractive powers. Good flint-glass for optical purposes is extremely difficult to make, especially when the required slabs or disks are of large size. It must be perfectly homogeneous and free from striæ, and it will be deficient in refractive power if it does not contain a very large proportion of lead, which, from its weight, has a strong tendency to settle at the bottom of the crucible, and so destroy the homogeneity of the glass. The fused glass is therefore continually stirred until it has cooled to a consistency sufficiently thick to prevent the lead settling, and is then left still in the crucible to complete the cooling. When cold, the crucible is broken away, and the result is a cake of immensely heavy glass, of which it is not yet known whether the value is to be calculated in pounds or pence. It is afterward reheated, brought to the required disk-like shape, and then tested for flaws. If these are numerous, as many smaller disks or slabs are taken from it as possible. Two exceptionally large disks of optical glass, 24 inches in diameter, were purchased a few years ago from Messrs. Chance of Birmingham, England, for £1,000 each. The heaviest crown and flint glass for optical purposes made by that eminent firm, have the respective densities of 2.55 and 4.45. A great many experiments in connection with optical glass have been tried of late years with chemical substances other than those above named, the result of which will be found in the Reports of the British Assoc. for the advancement of Science.

Slag-glass.—The slag from iron blast-furnaces is itself a coarse glass, but until lately it has been a waste product. Bricks, however, have been successfully made from it of late years; and still more lately, glass bottles are made from it. The slag is used in the molten state as it runs from the iron-furnaces, which, of course, so far saves fuel, but it requires to be mixed to the extent of nearly one-half its bulk with other materials. The process is said to be successful; yet it seems that there must be great difficulty in procuring, for any length of time, slag of nearly the same composition. *Slag-wool* is a name for this same iron-slag when blown into glass threads of a hair-like fineness, in which state it somewhat resembles wool, and was employed for non-inflammable coatings. It has been largely superseded by a rock fibre—mineral wool.

Toughened Glass.—Much curiosity was excited when, 1875, M. de la Bastie, French engineer, announced that he had succeeded, after many experiments, in making glass so 'tough,' that it could scarcely be broken. His original

process consists in heating any piece or pieces of glass till they are about to soften, and then plunging them into a bath of oil at a greatly lower temperature. Usually, however, a mixture chiefly of oily substances, such as oils, tallow, wax, rosin, etc., is put in the bath; and some manufacturers, who worked the process for a time, dropped the newly-made glass vessels while still hot into the oleaginous mixture, by which plan neither reheating nor annealing by the ordinary process is required. After the articles acquire the temperature of the bath they are removed. Either from the want of care or from some other cause, the results of the treatment by De la Bastie's process are not uniform, because many samples of his toughened, or, as it should rather be called, hardened glass, are almost as easily broken as ordinary glass.

Malleable Glass.—American glass workers since the beginning of the industry have endeavored to produce a glass that would have all the clearness and beauty of ordinary glass, and at the same time possess a toughness which would render it as little liable to fracture as many of the other manufactured articles of use and beauty. It was well known that the ancients had discovered and made use of a process of making malleable glass. But its manufacture remained a lost art until 1903, when Mr. Louis Kauffeld, of Matthews, Ind., after many years of endeavor, succeeded in producing a glass which will withstand extremely rough usage without breaking. The secret lies principally in the chemicals which are used and in the proportion of ingredients which form the com- and in the proportion of ingredients, although the furnaces and crucibles play an important part in the process.

Wire Glass: See Wire Glass.

Coloring of Glass.—Any kind of glass can be colored by metallic oxides, and the chief colors given by these are noted in the following list. *Crimson* of various shades, from gold, 'Purple of Cassius' (a compound of gold and tin) being the compound generally used. So small a quantity as $\frac{1}{100000}$ part of gold imparts a rose color. A red color is also got from protoxide of copper. *Purple or violet-red* is obtained from peroxide of manganese. *Blue* from oxide of cobalt or oxide of copper, chiefly from the former. *Green* from the same oxides, together with sesquioxide of iron; a fine green is got likewise from sesquioxide of chromium. *Yellow* from oxide of antimony or sesquioxide of iron; sometimes from carbon. Sexquioxide of uranium gives a beautiful opalescent-yellow with a greenish cast. Chloride of silver is used to stain glass yellow. Arsenious acid produces an opaque *white;* so also does the mineral Cryolite (q.v.), as well as aluminate of soda. Aventurine glass is a beautiful material of a brownish-red color, with gold-like spangles, in imitation of aventurine (or Avanturine, q.v.) quartz. It is largely used in the ornamental glass made at Venice.

Colored glass is made in several ways. When the color is all through the body, the glass consists of *pot-metal;* but

for some purposes, and especially when the coloring material is expensive, it is *flashed*, that is, a thin veneer of colored, coats a greater thickness of clear glass. In this case the two layers are 'gathered' from different pots on the blowing-iron, and blown out together as one sheet. Sometimes a very thin colored coating is put on clear glass by spreading, say a red glassy powder on the surface of the latter, and then carefully fusing it. When the chloride or other salt of silver is used to give a yellow, orange, or red, the glass is merely *stained* on the surface. In painted glass, the decoration is usually produced by enamel colors painted on with a brush, and afterward fired at a moderate heat. Single sheets of glass, each with several shades of the same color, are now made for glass-stainers, by which much shading by hand is dispensed with. A pane or vessel of flashed glass may be ornamented by partially removing the colored layer, either by cutting or etching, and in the case of many designs additional enamel color is added. Hydrofluoric acid, which corrodes glass, is commonly used to produce etched patterns upon it by protecting certain portions with a varnish, and allowing the acid to act upon the unprotected parts.

For one application of colored glass to ornamental purposes apart from painted windows, see GEMS, ARTIFICIAL; but the recent success of M. Feil of Paris, in his attempts to imitate not the color only, but also the hardness of real gems, is very wonderful. Venice, which a quarter of a century ago produced almost nothing in glass but beads, is once more making on a large scale glass articles, whose quaint forms and rich colors are little, if at all, inferior to her best ancient products. The well-known Bohemian glass, much of which is colored and gilt, but which in past days was often more showy than tasteful, has very recently shown remarkable advances in the character of its decoration. Some very tastefully ornamented colored glass is made in France.

Glass-cutting and Engraving.—It is usually flint glass that is so treated; and vessels intended to have cut-patterns are blown with thick walls. The first operation in glass-cutting is usually done on an iron grinding-wheel, 10 or 12 inches in diameter, and about three-fourths of an inch thick, made to revolve vertically by a belt and pulley. Immediately above a hopper-shaped cistern is placed, which supplies the wheel with the necessary mixture of sand and water. If a faceted pattern is to be given to a decanter or other object, it is first roughed out on this wheel by the grinder holding the vessel against it. The facets now formed on the glass are next made smoother by a fine sandstone wheel, fed with water only, and similarly driven. For many purposes, this wheel is of an angular section on the edge. The ground parts are finally polished upon a wooden wheel, supplied with moist putty-powder (oxide of tin) or other fine polishing material. The obscuring of glass by the ordinary process is done with sand

and water alone; but much of this kind of work is now done by Tilghman's sand-blast process, noticed below. Engraved patterns are produced by means of small copper disks revolving in a lathe, emery powder, mixed with oil, being applied to the edges of their circumference. We have already referred to the use of hydrofluoric acid for etching glass.

Tilghman's Sand-blast.—This is a very striking invention. The well-known fact that windows exposed to the action of wind-blown sand by the sea-shore, eventually become completely obscured, appears to have suggested the process. It consists in producing patterns on glass, marble and other materials by a strong blast of fine sand, emery, or corundum. In the case of glass, for which the process is as yet chiefly used, the sand-laden air-blast is produced by a fan (q.v.), but high-pressure steam can be resorted to in order to obtain great velocity of blast for very hard surfaces. If a pattern, say of a fern leaf, is wished, it can be cut out of sheet india-rubber or other material (the leaf itself will do), and gummed on the glass. On this being exposed for a short time to the sand-blast, the bare portions are worn down, and the pattern formed. When the whole surface of a pane of glass is exposed to the blast, it is, of course, quickly obscured.

Pressed Glass.—By this name is known a certain cheap class of objects, such as tumblers, small dishes, etc., with patterns in imitation of cut glass. Pressed glass is an American invention, and the process consists in pressing or shaping glass into form by means of a metal mold and reverse, called a plunger. By a somewhat similar but much older process, 'pinched glass' objects such as buttons are made.

Soluble Glass.—Both silicate of soda and silicate of potash, when they contain an excess of alkali, are soluble in water. They are then called soluble silicates, or sometimes, if prepared in the glassy state, soluble glass.—Fuch's soluble glass is a peculiar silicate, prepared by melting together 8 parts of carbonate of soda, or 10 parts of carbonate of potash, with 15 of pure quartz sand, and 1 part of charcoal added to facilitate decomposition of the alkaline carbonate. A black glass is thus obtained, which is not soluble in cold water, but dissolves in about six times its weight of boiling water. Fuchs commenced his experiments on this subject 1825, and continued and varied them for many years. The above is, we believe, the most approved formula. The practical uses of the soluble glass to which he especially directed his attention were two—(1), as a varnish, which, applied in the fluid form to stone surfaces, would harden into a glass, and prevent the ordinary effects of atmospheric influences; (2) as a means of fixing fresco-colors by the process known as stereochromy (see FRESCO; WATER-GLASS). Prof. Kuhlmann of Lille 1857 published his method of producing a stone-protecting silicate; and used it successfully for preventing the decay

of walls and houses built of inferior stone. He also employed soluble glass in print-works and tapestry-factories for fixing colors on cotton and on paper. It has been utilized also in washing wool, 40 parts of water being mixed with 1 of soluble glass at a heat of about 130° F.— Other processes employ concentrated solutions of silicate of potash, or of soda, as a cement for consolidating silicious sand into a very hard, durable, artificial, sandstone, capable, before it is fired, of being molded into any desired form; also they produce a vitreous varnish, consisting of silicate of potash, after which is applied a coating of a solution of chloride of calcium: a silicate of lime is thus formed, said to be very successful in protecting the surface of stone. The U. S. census of 1900 reported 355 glass manufactories, employing $61,423,903 capital and having finished products valued at $56,539,712 per annum.

GLASS'CHORD: musical instrument with keys like a pianoforte, but with bars of glass instead of strings of wire; invented in Paris 1785 by a German named Beyer. The name was given to the instrument by Franklin. The glass found no favor with the instrument makers, and none were ever made after that exhibited in Paris by the inventor, as possibly its construction and mechanism remained a secret with him.

GLASS'-CRABS (*Phyllosomata*): formerly classed as a family of crustaceans, of the division *Malacostraca*, order *Stomapoda* of Cuvier; now considered, at least in most cases, as larval forms of decapods in a certain stage of development. They are remarkable for the transparency of their bodies, whence their popular name, while the scientific name (Gr. leaf-body) refers to the great horizontal expansion of the carapace. They have little resemblance to crabs. The head is represented by a large oval plate, bearing eyes mounted on very long stalks; a second plate, the breadth of which much exceeds its length, represents the thorax, and bears the feet, most of which are long, and some of them, as in a few other crustaceans, bifid, with one branch much longer than the other. The abdomen is small. Milne-Edwards supposes these creatures to have no special organs of respiration, but that the blood is aerated through the general surface of the body. They are found in tropical and sub-tropical seas; and so transparent are they, that, when floating on the surface of the water, they would not be perceived but for the beautiful blue of their eyes.

GLASS'ITES, or GLAS'ITES: see SANDEMANIANS.

GLASS'MEN: in England, wandering rogues or vagrants, under statutes 39 Elizabeth c. 4, and 1 James I. c. 7.

GLASS'-PAINTING: application of colored glass to the artistic decoration of windows.

A method of making ornamental glass-windows was to produce the pattern in outline with finely made leaden frames, into the grooves of which pieces of colored glass or

of stained glass were fitted. This method, with modifications, is still employed; and glass with the old, rough character of surface has been much used in recent work. But modern chemistry has so improved the art of glass-staining, that large pictures are now produced on single sheets of glass, as in the case of windows shown in the London Exhibition 1851, one of which was nine ft. high by three ft. broad. It was on plate-glass, and had to be fired 15 times, yet it was perfectly smooth, and though somewhat deficient in brilliancy of color, was an effective composition.

One of the best known early applications of glass to window decoration is in the monastery of Tegernsee, Upper Bavaria, which was secularized 1802, and is now a private residence; but these windows (executed in the latter half of the 10th c.), like all of the first attempts, were only tasteful arrangements of colored glass in imitation of the stone mosaics used for floors, etc.; nor did the art rise much above this for at least three centuries after its origination, but in the 13th c., owing to the full development of the Gothic style of architecture, it became of immense importance, colored glass taking the place of tapestried curtains in filling the spaces within groined arches. The mosaic patterns were superseded by elaborate designs, not only in beautiful arabesque and other styles, but even pictorial compositions were attempted; and to such perfection did this come, that many of the works of the 15th c. are marvels of art. In all of these, the figures, excepting the faces, were made of pieces of self-colored glass combined with great skill and taste; the features were painted in enamel colors, and burned in. Gradually the art of shading, by removing certain portions of the colored surface, and other improvements, were introduced. This was the culminating point in the first period of glass-painting, as it is called; at this point the art seemed to have attained the highest perfection of which it is susceptible, for the efforts which followed to improve it by assimilating it to oil-painting signally failed, and with this failure began that decline in art which was perhaps more remarkable in the instance of glass-painting than in any other. It was soon felt that the true art was lost. In the present century, rapid improvement has been made, and the renaissance bids fair to eclipse the glory of the first epoch. The great seats of this art are now in Munich, Nürnberg, Paris, Birmingham, Edinburgh, and one or two more places; and it never received more liberal patronage in its palmiest days than it now does.

GLASS' SNAKE (*Ophisaurus*): genus of lizards, of sub-order *Brevilingua*, family, *Ptychopleuridæ* (*Zoneuridæ*, q. v.); allied to the *Scinscidæ*. The only known species is found in the United States; it is serpent-like in form, may be over three ft. long, and is destitute of limbs. The body and tail are marked with transverse lines of black, green, and yellow. It feeds on insects, mollusks, etc., and can neither climb nor swim. It is remarkable for the readiness

with which the joints of the tail break off upon any irritation, the joints thrown off being soon reproduced. The caudal muscles do not pass from one joint to another, so that the breaking of the tail involves no rupture of muscular fibres, but only a separation of one muscular plate from another.

GLASS-SPONGES, certain silicious sponges are so-called from the fact that the fibres or spicules composing their solid framework or skeleton is like finely spun glass. The glass-sponges, such as the Venus' flower-basket (*Euplectella*) and allied forms, live in fine sandy mud in deep water. The *Euplectella* inhabits the ocean around the Philippine Islands in from 10 to 20 fathoms. It forms a hollow cylinder or basket-work of spicules, enlarging at the top, which is broad and a little convex; it grows rooted in the sandy mud, anchored by its long glass spikes, which at the extremity end in anchor-like hooks. A number of similar but shorter, more dense sponges (*Holtenia*, etc.) live at great depths in the Atlantic, one kind occurring in shallower water (100 fathoms) in the Gulf of Maine. The glass-sponge of the Japanese seas is *Hyalonema*, in which the stem is twisted, composed of fibres, like spun glass, while the body of the sponge is long and slender; it grows nearly three feet in length. These glass-sponges, with the spicules having three crossed axes, or six threads radiating from a common point, are grouped in a family (*Hexactinellidæ*). The efferent canals are loosely meshed, while the digestive chambers (ampullæ) are large and barrel-shaped.

GLASS'WORT (*Salicornia*): genus of plants of the nat. ord. *Chenopodiaceæ*, having uniform hermaphrodite flowers, with a single fleshy obscurely lobed perianth inbedded in an excavation of the *rachis*, one stamen or two, and a short style, the fruit a *utricle* inclosed in the enlarged perianth. Some species, abundant on the Mediterranean shore, contain much soda, and are used, as is Saltwort (q.v.), in making *barilla*. One species (*S. herbacea*), a leafless plant with jointed stems, growing in salt marshes, is made into a good pickle and is sometimes sold for this purpose.

GLASTONBURY, *glâ'sen-bĕr-i:* ancient municipal burgh and market-town in the county of Somerset, England, 25 m. s.w. of Bath; built in the form of a cross, on a peninsula formed by the river Brue, or Brent, called the Isle of Avalon. It has small manufactures of silk; and has some export trade in timber, slates, tiles, and agricultural produce, by means of a canal connecting it with the Bristol Channel, and by the railway between the Bristol and Exeter and Wilts and Somerset lines which passes through the town. The town owes its origin to its celebrated abbey, which, according to the tradition, was founded A.D. 60, and was one of the earliest seats of Christianity in Britain. Its traditionary founder was Joseph of Arimathea, and the 'miraculous thorn,' which flowered on Christmas-day, was, till

the time of the Puritans, believed by the common people to be the veritable staff with which Joseph aided his steps from the Holy Land. The tree was destroyed during the civil wars, but grafts from it still flourish in the neighboring gardens. In 605 the monks adopted the dress and rules of the Benedictine order. This magnificent pile at one time covered 60 acres; but as most of the houses in Glastonbury and also a causeway across Sedgemoor, have been constructed of the materials, the extent of the ruins is now much diminished. The most interesting remains are the Abbey Church, with St. Joseph's Chapel, St. Mary's Chapel, and the Abbot's Kitchen. St. Joseph's Chapel is one of the most elegant specimens extant of the transition from Norman to Early English architecture, and is supposed to have been built during the reigns of Henry II. and Richard I. It is now roofless, and the vaulting of the crypt is nearly destroyed. The entrance is adorned with sculpture. Below the floor is a Norman crypt, within which is St. Joseph's Well. Of the Abbey Church, few fragments remain. The Chapel of St. Mary is roofless, but the remains of its pointed windows and archways are exceedingly elegant. The Abbot's Kitchen, now separate from the rest of the ruins, is a square massive structure, the walls strongly buttressed, and dates from about the 15th c. Glastonbury has the honor of ranking St. Patrick (415) and St. Dunstan among its abbots. In 1539, Henry VIII. summoned Abbot Whiting to surrender Glastonbury and all its treasures; and on his refusal, condemned him to be hanged and quartered, and the monastery confiscated to the king's use, which sentence was immediately carried into execution. According to tradition, King Arthur and his Queen Guinevere were buried in the cemetery of the abbey, and Giraldus Cambrensis states that 'a leaden cross, bearing the following inscription, "Hic jacet sepultus inclytus Rex Arthurus in insula Avallonia," was found under a stone seven ft. below the surface; and nine ft. below this was found an oaken coffin, containing dust and bones.' This disinterment took place by order of Henry II. Other objects of interest are the Church of St. Benedict; the Church of St. John the Baptist, with a tower 140 ft. high; the Weary-all Hill, where, in the legend, Joseph of Arimathea rested from his weary pilgrimage; and the Tor Hill, where the last abbot of Glastonbury was put to death, 500 ft. above the sea-level, crowned by a tower, the ruin of a chapel of St. Michael. Pop. of town about 5,000.

GLATZ, *glatz:* town of Prussia, province of Silesia; a fortress of the second rank, between two fortified hills, on the left bank of the Neisse, 52 m. s.s.w. of Breslau. It has four Rom. Cath. churches and a gymnasium; and carries on manufactures of linen, damask, and woolen fabrics, and of leather and rose-garlands. During the Thirty Years' and the Seven Years' wars, Glatz was frequently besieged and taken. Pop. about 14,000, including 1,657 of a garrison.

GLAUBER, *glow'bėr*, Johann Rudolph; 1603–68; b.

Karlstadt, Franconia: German chemist and physician. Little is known of his life, except that he resided long at Salzburg, then at Kissingen, then at Frankfort-on-the-Main, then at Cologne, whence he probably removed to Amsterdam. Although a believer in the philosopher's stone and in the universal medicine, he contributed materially to the progress of chemistry. Poggendorff (in his *Biographisch-literarisches Handwörterbuch*) gives a list of about 30 of his works, of which a collected edition to the date of publication appeared, in two 4to vols. 1658–9, at Frankfurt, and another seven 8vo vols., Amsterdam, 1661. An English translation by Packe, in one large folio vol. was published, London, 1689. Glauber is known chiefly for his discovery of sulphate of soda, which he termed *sal mirabile*, and regarded as a cure for all diseases. See Kopp's *Geschichte der Chemie*, I. 128–133.

GLAUBER'S SALT, *glaw'bėrz sawlt*, [after Johann Rudolph Glauber, who discovered it 1658]: sulphate of sodium Na_2SO_4. Glauber prepared it by a distillation of common salt with sulphuric acid, and named it 'sal mirabilis.' It is a constituent of many mineral waters, and occurs throughout Europe, especially at Carlsbad and Seidlitz, and in North America, notably at the Great Salt Lake in Utah. It forms oblique prisms which effloresce on the soil or on rocks. These are of a gray or yellow color, earthy, but transparent and vitreous when newly broken. It is readily soluble in water, and when heated or exposed to the air melts in its water of crystallization. If the heat is sufficiently continued, the whole of the water is expelled and the anhydrous salt remains. Glauber's salt was formerly much used in medicine as a purgative, but it has now given place to milder aperients. Its chief use is in the manufacture of glass and sodium carbonate. See SODIUM.

GLAUBER'S SPI'RIT OF NI'TRE: one of the old terms for nitric acid.

GLAUCHAU, *glow'ċhow:* thriving manufacturing town of the kingdom of Saxony, picturesquely situated on the right bank of the river Mulde, 8 m. n.n.e. of Zwickau. Owing to the unevenness of its site, it is irregularly built; but its appearance is striking. It is the second in rank among the manufacturing towns of Saxony. Here and in the neighborhood, the weaving of every kind of goods flourishes; there are also important dye-works, print-works, iron-foundries, and machine-factories. Pop. 30,000.

GLAUCOMA, n. *glaw-kō'ma* [Gr. *glaukōma*, a certain disease of the eye—from *glaukos*, blue-gray, or sea-green: L. *glaucus*, bluish-gray]: disease of the eye, being an opacity of the vitreous humor, characterized by a bluish tint seen from without, and the absence of the peculiar characters of cataract (q.v.), which, in some respects, it resembles as regards the gradual obscuration of vision. It is almost incurable. GLAUCO'MATOUS, a. *-kō'mă-tŭs*, re-

sembling or pertaining to glaucoma. GLAUCOUS, a. *glaw'-kŭs*, of a sea-green color; a grayish blue; in *bot.*, covered or frosted with a pale-green bloom. GLAUCONIE [French term introduced by Brogniart]: name of several strata of different ages: the Glauconie Crayeuse and Sableuse are equivalent to the Upper and Lower Greensand, while the Glauconie Grossier is an Eocene deposit contemporaneous with the Bracklesham beds. GLAU'CONITE, n. *-kŏn-īt*, silicate of iron and alumina, forming small round grains in greensand, and in chloritic marls; composition, silica 46–56 per cent., ferruginous oxide 20–25, potash 5–13, water 0–10.

GLAUCOPIS, n. *glaw-kō'pĭs* [Gr. *glaukōpis*, having fierce gleaming eyes; *glaukos; ops*, the eye]: typical genus of *Glaucopinæ*, the wattle-crows, a sub-family of *Corvidæ*.

GLAU'CUS: genus of mollusks, referred to the class *Gasteropoda*, but having no distinct respiratory organs. The body is long and slender, gelatinous; furnished with three pair of digitated fin-like appendages, formerly supposed to be gills. The mouth has horny jaws, adapted for preying on other small marine animals. These small mollusks—about an inch and three-quarters long, of a blue color, and extremely delicate and beautiful—inhabit tropical parts of the Atlantic Ocean, and float inertly with irregular movements of the slender branches of their fins on the surface of the water.

GLAUCUS, *glaw'kŭs* [Gr. bright, gleaming]: name of several figures in Greek mythology or legend, among which the following are notable:

GLAUCUS, surnamed PONTIUS, fisherman of Bœotia who ate some of the magical herb sown by Chronos, was transformed into a god and endowed with the gift of unerring prophecy, became builder of the *Argo* and helmsman of the Argonauts, and is represented in art as a hearty old man with flowing hair and beard, whose body terminates in a scaly tail.

GLAUCUS, surnamed POTNIEUS, son of Sisyphus and father of Bellerophon, worshipped as a deity chiefly in Corinth. Venus, offended at his conduct toward her, inspired his mares with such fury while at the funeral games of Pelias at Iolcus that they tore his body to pieces. He was the subject of a lost tragedy of Æschylus, and is represented in art in a group of frantic horses.

GLAUCUS, son of Minos, who when a child was smothered by falling into a cask of honey, and was afterward discovered by the soothsayer Polyidus. Minos desired Polyidus to restore the child's life, and when he failed shut him up with the body in a tomb till he should do so. While in the tomb Polyidus killed a serpent, and saw a second one revive it by laying a certain herb on the dead body. Whence he gathered the herb and restored Glaucus by rubbing his body with it. Minos made Polyidus teach Glaucus the art of divination and prophecy before he would release him, and when he was allowed to

return to his native country he deprived Glaucus of all his new powers.

GLAUCUS, son of Hippolochus and grandson of Bellerophon. He was a Lycian prince, assisted Priam in the Trojan war, exchanged his golden suit of armor with Diomedes for an iron one, showed great bravery in his encounters with the Greeks, and was killed by Ajax.

GLAUX, *glawks:* genus of plants of nat. ord. of *Primulaceæ*, having a 5-lobed calyx, no corolla, and a 5-valved capsule with about five seeds. G. *maritima*, sometimes called SEA MILKWORT and BLACK SALTWORT, common on some muddy seacoasts, is a small plant, with branching stems, often procumbent, and small fleshy leaves. It is made into a good pickle.

GLAVE, n. *glāv:* see GLAIVE.

GLAZE, v. *glāz* [from *glass*, which see]: to furnish with panes or windows of glass; to cover with a smooth coating of glass, as in earthenware; to give a smooth glassy surface to; to cover with anything smooth and shining: N. the vitreous or glasslike surface given to earthenware, etc. (see POTTERY). GLA'ZING, imp. giving a smooth shining surface to: N. the act of giving a smooth shining surface to; the vitreous substance with which potters' ware is covered; the act of furnishing or covering with glass; that part of oil-painting which consists in the application of an extremely thin layer of color over another to modify its tone. GLAZED, pp. *glāzd:* ADJ. furnished with glass; incrusted with a glasslike substance; rendered smooth or shining. GLAZIER, n. *glā'zher*, one who sets glass in window-frames.

GLAZEBROOK, RICHARD TETLEY: an English physicist; b. in Liverpool, 1854, Sept. 18; was educated at the University of Cambridge; became instructor of experimental physics there in 1882, and later was appointed assistant director of the Cavendish laboratory. In the same year he was made a fellow of the Royal Society of London. His publications include *Physical Optics*; *Practical Physics* (with W. N. Shore); *James Clerk Maxwell and Modern Physics;* and many papers, principally on optics. Also wrote *Heat, Light, Dynamics* and *Statics*, joint vols. in *Physical Series of Cambridge Natural Science Manual*, of which he became general editor.

GLAZOUNOFF, ALEXANDER: a Russian composer; b. in St. Petersburg, 1865, Aug. 10; studied under Rimsky-Korsakoff. Many striking effects are noticeable in his works. In 1893, the jury of the Columbian Exhibition Chicago, awarded him a medal in recognition of his compositions. Among his best known works are *Suite*, op. 2; *Waltzes*, op. 23; *Two Morceaux*, op. 22; *Prelude and Two Mazurkas*, op. 25; *Grande Valse de Concert*, op. 41; etc.

GLEAM, n. *glēm* [Sw. *glimma*, to glitter: Norw. *glima*, to shine bright: Icel. *glampa*, to glitter]: a shoot or stream of light; a beam; a ray; transient lustre: V. to shoot out, as a ray of light; to shine. GLEAM'ING, imp.: ADJ. shining

with a gleam: N. a shoot or shooting of light. GLEAMED, pp. *glēmd.* GLEAM'Y, a. *-ĭ,* darting beams of light; flashing.—SYN. of 'gleam, n.': a beam; glimmer; shoot; ray; glitter; sparkle; shine; brightness; splendor; lustre.

GLEAN, v. *glēn* [F. *glaner,* to glean—from *glane,* a handful of ears of corn—from mid. L. *glenārĕ:* prov. Dut. *glema,* a bunch of straw or sedge: comp. Gael. *glan,* to clean]: to gather on the field what the reapers have left behind; to collect things thinly scattered: N. a collection made by gleaning, or by slow degrees. GLEAN'ING, imp.: N. the act of gathering what is left behind by the reapers; what has been gathered or gleaned. GLEANED. pp. *glēnd.* GLEAN'ER, n. one who gathers after reapers; one who gathers slowly and laboriously.

GLEBE, n. *glēb* [F. *glèbe*—from L. *glēbă,* a clod or lump of earth: It. *gleba*]: soil; ground; a tract of land belonging to a church living or benefice. GLE'BY, a. *-bĭ,* cloddy; turfy. GLEBULÆ, n. plu. *glē'bū-lē,* in *bot.,* masses in appearance like crumbs.

GLEBE, in Ecclesiastical Law of England and Scotland: the land possessed as part of an ecclesiastical benefice, or from which the revenues of the benefice arise. The assignment of glebe-lands was formerly held to be of such absolute necessity that without them no church could be regularly consecrated. In England the word manse includes both the parsonage-house and the glebe, whereas in Scotland it is applied exclusively to the house. The fee-simple of the glebe is held by the law of England to be in *abeyance,* from the French *bayer,* to expect—that is to say, it is only 'in the remembrance, expectation, and intendment of the law;' but after induction the freehold of the glebe is in the parson, and he possesses most of the powers of a proprietor, with the exception (since the Reformation) of the power of alienation. In England, in addition to his glebe lands, the rector or vicar is seized also in the edifice of the church itself. See CHURCH.

In Scotland, as in England, a glebe forms, as a general rule, a portion of every ecclesiastical benefice of the Established Church, and is thus an addition to the stipend, and sometimes a very important one. Ministers in royal burghs, however, cannot in all cases claim glebes; and where a parish is separated into two portions, it does not necessarily follow that the new parish shall contain a glebe.

GLEDE, or GLEAD, n. *glēd,* also GLED, n. *glĕd* [from *glide,* in allusion to its gliding or hovering motion]: rapacious bird, called also a kite; in common English versions of the Bible, prob. the vulture.

GLEDE, or GLEED, n. *glēd* [Icel. *gloa;* Ger. *glühen,* to glow: Dut. *gloed,* hot coals; *gloeden,* to glow]: in *Scot.* and *OE.,* a hot ember; a live coal; flame.

GLEE, n. *glē* [AS. *glig,* music, sport; *gliowian,* to sing; to play: Icel. *gly,* laughter, gladness; comp. Gael. *ceòl,* music]: joy; merriment; gayety; English name of a vocal

composition sung in parts, for three or more voices, and in one or more movements: the style is quite different from that of the part-songs of Germany (see W. A. Barrett's *The English Glee and Madrigal Writers*); a song. GLEE'FUL, a. *-fûl*, merry; cheerful. GLEE'FULLY, ad. *-lĭ*. GLEE'SOME, a. *-sŭm*, merry; joyous. GLEE'MAN, n. a minstrel.

GLEE, or GLEY, v. *glē* [Scot. *gley*, to look obliquely: Icel. *glæa*, to glance]: in *Scot.* and *OE.*, to squint; to look obliquely from a malformation of the eyes. GLEE'ING, imp. GLEED, or GLEID, a. *glēd*, in *Scot.*, glee-eyed; having squinting eyes.

GLEEK, v. *glēk* [Dut. *glicken*, to shine: Scot. *glaiks*, reflection from a shining body in motion; *glaik*, a deception: Icel. *leika*, to play]: in *OE.*, to jeer; to banter; to scoff. GLEEK'ING, imp. GLEEKED, pp. *glēkt*.

GLEET, n. *glēt* [F. *glette*, the froth of an egg: Low Ger. *glett*, slippery]: a slimy or glairy discharge from a wound; a thin humor running from an ulcer, now usually restricted to the result of gonorrheal disease (see GONORRHŒA). GLEETY, a *glēt'ĭ*, thin; limpid.

GLEG, a. *glĕg* [Gael. *glic*, wise]: in *Scot.*, sharp; lively; keen; quick of perception: N. a glimpse; a short time.

GLEICHENIA, n. plu. *glī-kē'nĭ-ă* [after Baron *Gleichen*, a German botanist]: genus of the ord. *Fĭlĭcēs*, or ferns, admired for their graceful forms, and tender, feathery, drooping branches.

GLEN, n. *glĕn* [W. *glyn:* Gael. *gleann*, a valley: W. *glan*, brink, bank]: a hollow space between hills; a narrow valley.

GLENELG, *glĕn-ĕlg':* shallow river of considerable length, rising in the s.w. of Victoria, and after crossing the boundary into s. Australia, entering the Southern Ocean between Cape Northumberland on the w. and Cape Bridgewater on the e. Its mouth is about lat. 30° s., and long. 141° east.

GLENLIV'ET: vale or district in the s.w. of Banffshire, Scotland, extending along the Livet, a small feeder of the Avon, about 21 m. s.w. from Huntly. It contains iron ore and lead, and has long been famous for finely flavored whiskey. Here a battle between the Earl of Argyle and the Earl of Huntly 1594, resulted in the defeat of Argyle.

GLENOID, a. *glē'noyd* [Gr. *glēnē*, the pupil of the eye, a socket for a bone; *eidos*, form]: in *anat.*, applied to a round shallow excavation in a bone to receive the head of another bone. GLENE, n. *glē'nē*, the hollow part of a bone, a socket.

GLENS FALLS: village of Warren co., N. Y., on the Hudson river and the Del. and Hudson R. railroad; 9 m. s. of Lake George, 49 m. n. of Albany, 190 m. s. of Montreal, 202 m. n. of New York. Glens Falls was settled in 1763 and incorporated 1837. The region is agricultural but in the immediate vicinity are stone, limestone, and black-marble quarries. There are also various manufac-

tures such as flour, paper, lime, timber, collars and cuffs, etc. The village contains two academies, a free library, hospital, and a home for old ladies. The waterworks are owned and operated by the village. Pop. (1910) 15,243.

GLENTILT, *glĕn-tĭlt:* deep, narrow valley in the n. of Perthshire, Scotland; extending s.w. from the Grampians on the n. to Strathgarry on the s. and 15 m. in length. Through the bottom of the glen the Tilt rushes with great impetuosity, and the mountains on each side are scored with innumerable torrents. Its upper half is inclosed among mountains of 3,350 to 3,589 ft. high, and its left boundary is mainly formed by the huge Ben-y-Gloe, which rises from a broad base, and has many summits, the highest 3,725 ft. above sea-level. The lower half is less wild. This glen is classic-ground to the geologist. Several elaborate accounts of its geological phenomena have been published.

GLIADIN, n. *glī'ă-dĭn* [Gr. *glīă*, glue]: an albuminoid found in crude wheat gluten; vegetable glue; glutin.

GLIB, a. *glĭb* [Low Ger. *glippen*, to slip: Dut. *glibberig*, slippery: Dan. *glippe*, to slip: L. *glaber*, smooth]: slippery; voluble; easily moved, as the tongue. GLIBLY, ad. *glĭb'lĭ.* GLIB'NESS, n. *-nĕs*, smoothness; volubility of the tongue.—SYN. of 'glib'; fluent; smooth; flippant.

GLIB, n. *glĭb* [Ir. and Gael. *glib*, a lock of hair]: in *OE.*, a bunch of thick, curled hair made to hang over the forehead and eyes.

GLIB, v. *glĭb* [Dut. *lubben;* Scot. *lib*, to castrate]: in *OE.* to castrate. GLIB'BING, imp. GLIBBED, pp. *glĭbd.*

GLIDDON, *glĭd'on*, GEORGE R.: American Egyptologist, antiquary, and ethnologist: 1807–57; b. Grand Cairo, Egypt, where his father, John Gliddon was for many years U. S. consul. Gliddon resided 32 years in the valley of the Nile and in the Levant, and for several years was U. S. consul of Cairo. About 1840, Gliddon visited London, Paris, and his own country to which he had been entirely a stranger; and lectured in all the principal cities, on Egyptian and other Oriental antiquities. Of his earliest work, *Ancient Egypt, her Monuments, Hieroglyphics, History, and Archæology*, etc., 18,000 copies were sold in America in three years. He published about the same period, *Appeal to the Antiquaries of Europe on the Destruction of the Monuments of Egypt; Discourses on Egyptian Archæology; A Memoir on the Cotton of Egypt;* and *Otia Ægyptiaca.* He found a generous friend in Richard K. Haight of New York, who furnished him with money for a visit to London, Paris, and Berlin. The results are in two quarto vols., published by Mr. Gliddon with the co-operation of Dr. Nott, of Mobile, and several other savants, European and American. In 1854 was published *Types of Mankind, or Ethnological Researches based upon the Ancient Monuments, Paintings, Sculptures, and Crania of Races*, etc., by Nott and Gliddon, and containing papers by Dr. Morton, craniologist, of Philadelphia, Prof. Agassiz, and Drs. Usher and Patti-

son of Philadelphia. In 1857 was published, under the joint names of Nott and Gliddon, a quarto vol., *Indigenous Races of the Earth, or New Chapters of Ethnological Inquiry,* including Monographs by Alfred Maury, librarian of the French Institute; Francis Pulszky, learned Hungarian; and Prof. Meigs of Philadelphia. Mrs. Gliddon, an accomplished artist, drew on wood its numerous illustrations. Just as this work was published, Gliddon died at Panama, whither he had gone on ethnological research. He was an enthusiast in investigation and in the advocacy of his theories, and unsparing in criticisms of opponents. He labored to prove the great antiquity and diversity of origin of the human races. His works have met severe criticism on these points. The materials which he brought together are valuable and suggestive; but his treatment of them is not satisfactory; and he is not free from indications of a bias in favor of the enslavement of the races that he considered inferior.

GLIDE, v. *glīd* [AS. *glidan,* to slip down gently: Dan. *glide;* Sw. *glida;* Dut. *glijden,* to slide: Icel. *gladr,* shining, clear]: to flow gently, as water; to move silently and smoothly; to pass rapidly and easily: N. the act or manner of moving smoothly and swiftly. GLI'DING, imp. GLI'DED, pp. GLI'DINGLY, ad. *-lĭ.*

GLIFF, n. *glĭf:* in *Scot.,* a glimpse; a transient view; a moment; sudden fear.

GLIMMER, v. *glĭm'mėr* [Low Ger. *glimmern,* to shine: Dan. *glimre,* to glimmer: Sw. *glimma;* prov. Sw. *glimmer,* to glitter]: to send forth feeble or scattered rays of light; to shine faintly: N. a feeble light; mica or muscovy-glass. GLIM'MERING, imp.: ADJ. shining faintly: N. a faint beaming of light; a faint view. GLIM'MERED, pp. *-mėrd.*—SYN. of 'glimmer, v.': to gleam; glitter, etc.: see GLEAM.

GLIMPSE, n. *glĭms* [Swiss, *glumsen,* a spark: Dut. *glimpen* and *glinsen,* to glow, to sparkle]: a short transitory view; a glance; a weak faint light: V. to appear by glimpses. GLIMP'SING, imp. GLIMPSED, pp. *glĭmst.*

GLINKA, *glĭngk'â,* MICHAEL IVANOVICH: 1804–1857, Feb. 14; b. Novospassky, govt. of Smolensk, Russia: musical composer. He studied music in St. Petersburg, in Italy 1830-3, and finished his training with Dehn in Berlin. He then returned to Russia, and 1836, Nov. 27, produced in St. Petersburg his first operatic composition, *Life for the Czar,* which had great success and became the basis of the present Russian school of national music, beside winning for its author the appointment of imperial chapelmaster and conductor of opera. His next composition was an overture and four entre-actes for Kukolnik's drama *Prince Kholmsky,* and in 1842, he produced his second opera *Russlan and Lyudmila,* based on Poushkin's poem. Two years later he again went abroad and spent the most of his time in Paris and Spain. After returning to St. Petersburg he composed and arranged several pieces for the orchestra and numerous songs and romances; among

the former the *Kamarinskaya* obtained popularity beyond Russia. He died suddenly in Berlin as he had just begun another foreign tour.

GLINKITE, n. *glĭng'kīt* [named after Lieut.Gen. *Glinka*]: pale-green variety of olivine, by some placed under chrysolite; found in talcose schist.

GLINT, n. *glĭnt*, or GLENT, n. *glĕnt* [Dan. *glimte*, to gleam, to flash: Gael. *glinn*, the sky, a light]: in *Scot.* and *prov. Eng.*, a glance or flash from; a sly glance; a smart or sudden stroke: V. to glance or flash from. GLINT'ING, imp. GLINTED, pp. *glĭnt'ĕd.*

GLIOMA, n. *glī-ō'mă*, GLIOMATA, n. plu. *glī-ō'mă-tă* [Gr. *glia*, glue]: tumor peculiar to the connective tissue which holds together the nerve substance in the brain and similar nervous structures, generally in the brain or retina; nearly allied to the sarcoma, consisting of primitive cells resembling those of the insterstitial substance of nervous structure: see TUMORS.

GLIRES, *glī'rēz* [Lat. pl. of *glis*, a dormouse]: in the Linnæan system of zoology, an order of mammalia corresponding to the *Rodentia* (q.v.) of Cuvier and recent naturalists.

GLISSON, *glĭs'n*, OLIVER S., U.S.N.: b. in Ohio, 1809. Jan. 18. He was appointed a midshipman 1826, Nov. 1, promoted passed midshipman 1832, commissioned lieut. 1837, promoted commander 1855, capt. 1862, commodore 1866, rear-admiral 1870, and retired 1871, Jan. 18. He was in command of the *Reefer* during the Mexican war, on the Japanese expedition under Com. Perry, and commanded the *Santiago de Cuba* in the attacks on Fort Fisher 1864, Dec., and 1865, Jan. After the war he commanded the League Island Station, and, as rear-admiral, the European squadron.

GLISSON'S-CAPSULE, n. *glĭs'sonz-kâp'sūl* [from Dr. Francis *Glisson*, b. 1597, prof. at Cambridge Univ., who first pointed it out]: a sheath of areolar tissue, surrounding the branches of the portal vein, the hepatic artery, and the hepatic duct.

GLISTEN, v. *glĭs'n* [Dut. *glisteren*, to sparkle: AS. *glisian*, to glisten: Icel. *glyssa*, to sparkle, to glitter]: to shine; to sparkle with light. GLISTENING, imp. *glĭs'nĭng.* GLISTENED, pp. *glĭs'nd.* GLISTER, v. *glĭs'tėr*, to shine; to be bright. GLIS'TERING, imp.: ADJ. sparkling with light; shining. GLIS'TERED, pp. *-tėrd.*

GLITTER, v. *glĭt'tėr* [Icel. *glitra*, to sparkle, to glitter (see GLISTEN)]: to sparkle with light; to gleam; to be showy or striking: N. lustre; bright show; splendor; show of splendor which has no solid foundation. GLIT'TERING, imp.: ADJ. sparkling; brilliant; splendid. GLIT'TERED, pp. *-tėrd.* GLIT'TERINGLY, ad. *-lĭ.*—SYN. of 'glitter, v.': to sparkle; glare; shine; glisten; beam; shoot; ray; flash.

GLOAMING, n. *glōm'ĭng* [AS. *glomung:* prov. Dan.

glomme, to glow, to begin to shine (see GLOOM)]: in *Scot.*, twilight; the fall of the evening.

GLOAT, v. *glōt* [prov. Sw. *glutta;* Norw. *glytta*, to look out from the corner of the eye: Icel. *glotta*, to grin: comp. Gael. *glut*. voracity: Ger. *glotzen*, to regard with fixed staring eyes]: to gaze upon earnestly or with admiration; to contemplate with exultation, in a bad sense; to enjoy immoderately. GLOAT'ING, imp.: ADJ. looking eagerly or greedily. GLOAT'ED, pp. GLOAT'ER, n. *-ėr*, one who.

GLOBE, n. *glōb* [F. *globe*—from L. *glŏbŭs*, a round body, a ball: It. *globo*]: a round or spherical body (see SPHERE); a ball; the earth; the round body on which the various regions of the earth are depicted, or on which the constellations of the heavens are laid down, the former being called the *terrestrial*, and the latter the *celestial globe* (see GLOBES). GLOBATE, or GLO'BATED, a. *glō'bāt*, or *-bā-tĕd* [L. *glŏbātus*, globe-shaped]: having the form of a globe. GLOBOSE, a. *glō-bōs'* [L. *globōsŭs*, round as a ball]: having the form of a ball; spherical. GLOBOUS, a. *glō'bŭs*, spherical; round. GLOBOSITY, n. *-bŏs'ĭ-tĭ*, the quality of being round; sphericity. GLOBULAR, a. *glŏb'ū-lėr*, round; spherical. GLOB'ULARLY, ad. *-lėr-lĭ*. GLOB'ULAR'ITY, n. *-lăr'ĭ-tĭ*, state of being globular. GLOB'ULE, n. *-ūl*, a little globe; a very minute particle of matter of a round form; in *bot.*, the male organ of the Charatribe, consisting of a small spherical body filled with elastic filaments; in *bot.*, the round transparent granules formed in the cellular tissue, which constitute fecula: see PARAGLOBULIN. GLOBULIN, or GLOBULINE, or CRYSTALLIN, one of a family of proteine bodies or albuminates; insoluble in pure water, but soluble in diluted solutions of salt. In association with hæmatine, as hæmato-globulin or hæmoglobin (q.v.) it is the main ingredient of the blood globules; and it occurs, mixed with albumen, in the cells of the crystalline lens of the eye, forming, according to Simon, from 10 to 14 per cent. of the dry lens. Hence its two names. In most of its relations it resembles albumen, but it differs from that substance in being precipitated from both acid and alkaline solutions by exact neutralization, and in being completely thrown down from its solutions by carbonic acid gas: see PROTEIDS. The globulins are now enumerated as follows: Globulin (or Crystallin), Paraglobulin (or Fibrinoplastin), Fibrinogen, Myosin, Vitellin. GLOB'ULOUS, a. *-lŭs*, having the form of a small sphere or globe.—SYN. of 'globe': sphere; orb; circle.

GLOBE-FISH: see DIODON.

GLOBE-FLOWER, (*Trollius*): genus of plants of nat. ord. *Ranunculaceæ*, having a calyx of colored (yellow) sepals, in number five or some multiple of five, the petals small and linear. There are several species, natives of colder parts of the n. hemisphere. The common G., the LUCKEN GOWAN of the Scotch (*T. Europæus*), is one of the finest ornaments of moist grounds and river banks in ele-

vated districts in n. Britain, and is sometimes cultivated in flower-gardens. The flower has a globe-like appearance.

GLOBES: pair of artificial spheres, hollow, of card-board coated with a composition of whiting, glue, and oil, on which is laid paper bearing certain delineations of the earth or the heavens. On one of the pair—the *celestial* globe—are represented the stars, so placed that, to an eye supposed to observe them from the centre of the globe, their relative position and distance correspond to those actually observed; while on the *terrestrial* globe, the distribution of land and water, the divisions and sub-divisions of the former, together with a few of the most important places, are shown.

The usual mode of manufacture is as follows: A ball of wood or iron is used as a matrix, and a layer of damped paper is carefully and closely placed upon this, without paste, and other layers are successively pasted over the first one; ordinary card-board is thus produced, but instead of being flat, as usual, it forms a spherical shell. When sufficiently thick, this is cut into two hemispheres, the section being made in the line of the intended equator. The hemispheres are then taken off the matrix, and again glued together, on an axis, and the whiting composition laid on, the outside of which is smoothed and finished to shape in a lathe. This composition is so laid on as to balance the globe that it may rest at whatever point it is turned. The smooth surface is now marked with the lines of latitude and longitude (see ARMILLARY SPHERE under ARMILLARY), and is covered with the paper on which the required geographical or astronomical delineations are engraved. In order to adapt the plane surface of the paper to the curvature of the sphere, it is printed in pieces, small circles for the Arctic and Antarctic regions, and the rest in lens-shaped gores, varying from 20° to 30° of longitude, and meeting these circles which are pasted first. Great care is required in laying on these curved pieces, so that their edges shall meet exactly without overlapping. The surface is then colored and strongly varnished, and mounted in its frame and stand. Globes of India-rubber and gutta-percha have been made; and others of thin paper to be inflated and suspended in a school-room. Bett's paper-globes fold up when not in use. Embossed globes show, in exaggerated relief, the elevations and depressions of the earth's surface. Compound globes including the celestial and terrestrial, are made with an outer glass sphere for the celestial, and orrery mechanism to show the varying relative positions of the sun and moon, etc. As apparatus for instruction, globes are used to illustrate the form and motion of the earth, the position and apparent motion of the fixed stars, and for the mechanical solution of a number of problems in geography and practical astronomy. For this purpose, each globe is suspended in a brass ring of somewhat greater diameter, by means of two pins exactly opposite to each other—these pins forming the extremities round the axis which it revolves, or the n. and s. poles. This

brass circle is then let into a horizontal ring of wood, supported on a stand (see ARMILLARY SPHERE). The globes in common use in schools are 12 inches in diameter; those in private libraries are frequently 18 inches.

The problems to which the globes are applied are such as: To find when a star rises, sets, or comes to the meridian on a given day at a given place: the mode of solution is given in any school-book on the subject. The answers obtained in this way to such questions are only rough approximations, and are in themselves of no value. But the 'use of the globes,' serves to show the mode in which many of the appearances connected with the motions of the earth and the heavenly bodies are caused, and to give a clear conception of the nature of the connected problems. The accurate solutions can be obtained only by trigonometrical calculations.

GLOBIGERINA, n. *glō-bĭj'ĕr-ī'nă* [L. *glŏbŭs*, a globe; *gero*, I carry]: genus of Protozoa (q.v.) belonging to the order Foraminifera (q.v.), the shells of which form the great bulk of the calcareous ooze or mud found in the bed of the ocean. The body of Globigerina is of simple protoplasm, inclosed in a shell of minute and irregularly arranged spheres of lime, through *foramina* or apertures in which are exuded filaments (*pseudopodia*) of the animal substance. The pseudopodia are used in locomotion and the capture of food. Globigerina still swarm in the upper strata of the ocean, and the shells are covered with fragile spines, which drop off as the organism dies and sinks to the sea-bed. Hence the shells were formerly described as without spines. The calcareous matter deposited in this way at the bottom of the ocean can be shown to be merely chalk in a non-consolidated state, and thus illustrates the process of chalk-formation: see OOZE. *G. bulloides* is the common species. Fossil species abound in the chalk and tertiary formations.

GLO'BUS HYSTER'ICUS, or BALL IN THE THROAT: name applied to a peculiar sensation in the throat: see HYSTERIA.

GLOCHIDATE, a. *glŏk'ĭ-dāt* or *glō'kĭ-dāt*, or GLOCHIDIATE, a. *glō-kĭd'ĭ-āt* [Gr. *glochis*, the angular end of anything, as of an arrow]: in *bot.*, applied to hairs, the divisions of which are barbed like a fish-hook.

GLOCKNER, or GROS GLOCKNER, *grōs glŏk'nėr:* highest peak of the Noric Alps, on the boundary between Tyrol, Carinthia, and Upper Austria; 12,431 ft. in height.

GLOME, n. *glōm* [L. *glŏmus*, a ball of thread or yarn] in *bot.*, a roundish head of flowers.

GLOMERATE, a. *glŏm'ĕr-āt* [L. *glŏmĕrātus*, gathered into a round heap—from *glŏmus*, a ball or clew of thread]: gathered into a round heap or head: V. to gather or wind into a ball. GLOM'ERATING, imp. GLOM'ERATED, pp. GLOM'ERA'TION, n. *-ā'shŭn*, act of gathering into a ball; a mass formed into a ball. GLOM'ERULE, n. *-ĕr-ūl*, in *bot.*, a

head or dense cluster of flowers; a powdery mass on the surface of some lichens. GLOMER'ULOSE, a. *-lŏs*, minutely clustered. GLOMERULUS, n. *glŏm-ĕr'ū-lŭs*, in *med.*, one of the small red bodies in the kidneys, consisting of tufts of minute vessels covered in by the dilate ends of the secreting tubes of the organ; in *bot.*, a rounded cymose inflorescence.

GLOMMEN, *glŏm'ėn*, or STOR-ELV (i.e., *great river*): largest river in Norway; flowing from Lake Aursund, at the town of Röros, lat. about 62° 40′ n,. and long. 11° 16′ e. Its source is 2,419 ft. above sea-level, and its course is interrupted by frequent water-falls, the last of which with a descent of 60 ft., is called the Sarpenfos or Sarpfos, and is about 10 m. from the mouth of the river. Large boats can ascend to the Sarpenfos. The Glommen flows first s.w. for about 50 m., then bends s.e., and after passing the fortress of Kongsvinger, turns s.w., and empties into the Skager Rack at Frederickstadt, after a course of about 320 m. Its most important affluents are the Rena on the left, and the Vormen on the right.

GLONOIN, n. *glō'noyn* [unascertained]: nitro-glycerine concentrated, or Nobel's blasting oil.

GLOOM, n. *glôm* [Ger. *glumm*, gloomy: prov. Dan. *glomme;* Swiss, *glumsen*, to glow in a covert way, as coals beneath the ashes: Scot. *glum*, a sour, cross look: prov. Sw. *glomma*, to stare fixedly]: a sour, surly look; partial darkness; thick shade; obscurity; cloudiness or heaviness of the mind; melancholy; sullenness; V. to be sullen; to shine dimly; to be dark; to make dark. GLOOM'ING, imp. GLOOMED, pp. *glômd*. GLOOM'Y, a. *-ĭ*, dark; dismal; clouded: heavy of heart. GLOOM'INESS, n. *-ĭ-nĕs*, obscurity; heaviness of mind; sullenness; moroseness. GLOOM'ILY, ad. *-lĭ*, darkly; dismally.—SYN. of 'gloomy': obscure; dim; opaque; dusky; cloudy; dejected; downcast; disheartened; depressed; sad; melancholy; morose; sullen; moody; heavy; dull.

GLORIA, *glō'rĭ-a:* hymn of doxology. The chief Gloria (or Great Doxology, or Angelic Hymn) begins with the words, *'Gloria in excelsis Deo'* (Glory be to God on high) and is founded on Luke ii. 14: John i. 29. Its place in the Roman mass is after the 'Introitus,' except on the penitential days in Advent and during Lent, when it is omitted. It is at the close of the communion service of the Anglican Prot. Epis., and Meth. Epis. churches, and is in use in many other denominations. Its use in the Eastern Church has extended through 1,500 years, and in the church in England 1,200 years. It was a compilation (perhaps by Telesphorus, Bp. of Rome, abt. 139) from a morning hymn of the early church near the time of the apostles; traceable in the first half of the 2d c.; and in its present form supposed to date from the middle of the 4th c. The *repetition* in the Anglican Book of Common prayer, 'Thou that takest away' etc., is no part of the ancient hymn—not being found in any ancient Latin or Greek liturgy, nor even in the earliest Prayer-Book in English, 1549. Its appearance in the

book of 1552, was possibly due to a printer's error.—*Gloria Patri*, (or the Less Doxology—Glory be to the Father, etc), is traceable in the 2d c.: it is of very frequent use.—*Gloria Tibi* (Glory be to Thee, O God) is a still shorter doxology used at the end of sentences, etc.

GLORIOSA, *glō-rĭ-ō′za:* genus of plants of nat. ord. *Liliaceæ*, having a perianth of 6 elongated and reflexed segments, a 3-lobed stigma, a 3-celled superior germen, and globose seeds. The best known species, *G. superba*, native of India, is a herbaceous perennial with a weak stem, 6–10 inches high, alternate leaves terminating in tendrils, and very beautiful flowers, finely colored with red and yellow.

GLO′RIOUS VIR′GIN, or ST. MARY THE GLORIOUS: order of knighthood in Venice, founded by Bartholomew of Vicenza, and approved by Pope Urban IV. 1262. This institution was ecclesiastical as well as military, and its objects were the protection of widows and orphans, and the furtherance of the peace of Italy. The badge was a purple cross between certain stars, and the costume a white surcoat on a russet cloak.—An order of knighthood of St. Mary the Glorious also existed in Rome in the 17th c., whose purpose was the suppression of the Barbary corsairs who infested the Mediterranean.

GLORY, n. *glō′rĭ* [OF. *glorie*—from L. *glōrĭa*, fame, renown: It. *gloria;* F. *gloire*, glory: Icel. *glora*, to glitter: comp. Gael. *glòir*, praise, honor—from *glòr*, speech, talk]: splendor; brightness; magnificence; praise ascribed in adoration and honor, as to God; heaven; Divine perfection, as glory of God; the circle of rays surrounding the head of a saint; honor; praise; fame: V. to exult with joy; to boast; to be proud of. GLO′RYING, imp. *-rĭ-ĭng*, boasting; exulting with joy: N. exultation; display of pride. GLO′RIED, pp. *-rĭd:* GLO′RIFY, v. *-rĭ-fī* [L. *facĭō*, I make]: to praise in honor or in worship; to exalt to glory; to extol. GLO′RIFYING. imp. GLO′RIFIED, pp. *-fīd:* ADJ. made illustrious; exalted to glory. GLO′RIFIER, n. *-ėr*, one who. GLO′RIFICA′TION, n. *-kā′shŭn* [F.—L.]: the act of giving glory or of ascribing honors to; state of being glorified. GLO′RIOUS, a. *-ŭs*, of exalted excellence and splendor; noble; illustrious; very successful or renowned, as a battle. GLO′RIOUSLY, ad. *-lĭ.* GLO′RIOUSNESS, n. *-nĕs.*—SYN. of 'glorious': eminent; excellent; renowned; magnificent; splendid; grand; praiseworthy; boastful; ostentatious;—of 'glory, v.': to boast; vaunt; rejoice, exult; be proud of.

GLOSS, n. *glŏs* [Icel. *glossi*, flame, brightness: *glossa*, to blaze, to sparkle]: the lustre of a body proceeding from a smooth pressed surface; specious appearance; external show; V. to give a superficial lustre to. GLOSS′ING, imp. GLOSSED, pp. *glŏst.* GLOSS′Y, a. *-ĭ*, having a smooth and shining surface. GLOSS′INESS, n. *-nĕs*, the lustre and brightness of a smooth polished surface. GLOSS′ER, n. *-ėr*, a polisher. GLOSS′ILY, ad. *-ĭ-lĭ*, in a glossy manner. *Note.*—Under the present and some succeeding titles it is difficult to group the words and separate the defini-

tions, their origin in most cases being ambiguous—for example, *gloss*, in the sense of *specious representation*, may apply to glosses of both kinds.

GLOSS, n. *glŏs* [OF. *glose*, or *glosse*—from L. *glossa*, a hard word needing explanation—from Gr. *glossa*, a tongue —see *note* below]: a comment—usually understood of comments, etc., on the margins of anc. MSS.; a remark intended to illustrate; interpretation artfully specious: V. to explain by comment (see GLOSS, in Biblical Criticism). GLOSS'ING, imp.: ADJ. dealing in glosses or comments. GLOSSED, pp. *glŏst*. GLOSSARY, n. *glŏs'ă-rĭ* [L. *glossārĭŭm*, a glossary]: a small dictionary appended to a book containing the difficult and unusual words to be found in it; the peculiar terms of any science or art arranged and explained as in a dictionary. GLOSSA'RIAL, a. *-ā'rĭ-ăl*, relating to or connected with a glossary. GLOSS'ARIST, n. *-ă-rĭst*, one who writes a gloss or commentary; a writer of a glossary. GLOSS'ER, n. *-ėr*, or GLOSS'IST, n. a writer of glosses; a commentator. GLOSSOG'RAPHER, n. *-ŏg'ră-fėr* [Gr. *graphō*, I write]: a commentator; one who defines and explains terms. GLOSSOG'RAPHY, n. *-ră-fĭ*, the definition and explanation of terms used in a science. GLOSS'OLA'LIA, n. *-o-lā'lĭ-ă* [Gr. *lalĭă*, speech]: the gift of tongues. GLOSSOL'OGY, n. *-ŏl'ŏ-jĭ* [Gr. *logos*, a word, discourse]: the science which investigates the number, connection, relations, and condition of the languages of the earth; the explanation of the special terms used in any science. *Note.*—GLOSS formerly meant a word from a foreign language, or an obsolete or poetical word, or whatever required explanation. It was afterwards used for the interpretation itself, and subsequently extended from a single word, interlined or placed in the margin, to an entire expository sentence, and in many instances to a sort of running commentary on an entire book.

GLOSS, in Biblical Criticism: properly an explanation of purely verbal difficulties of the text, to the exclusion of those which arise from doctrinal, historical, ritual, or ceremonial sources; there are however some theological glosses. The words which are commonly the subject of these glossarial explanations are reducible to five classes: (1) foreign words; (2) provincialisms or dialects; (3) obsolete words; (4) technical words; (5) words used by the author in some abnormal or exceptional signification. From an early period, these verbal difficulties were the object of attention, and the writers who applied themselves to the elucidation were called *glossatores*, and their works *glossaria*. The principal Greek glossatores; are Hesychius, Zonaras, Suidas, Phavorinus. Most of the Rabbinical writers have done the same work for the Hebrew text; so that it would be difficult to name any in particular as Hebrew glossatores. The chief glossatores of the Latin Vulgate are the celebrated Walafried Strabo in the 9th c., and Anselm of Laon, who continued Walafried's work in the 12th c.

In Roman and canon law, the practice of introducing glosses was of early origin, and probably was an imitation

of the biblical glosses. Among jurists, the gloss was not purely verbal, but regarded the true interpretation of the law, and in some cases it was held of equal authority with the text itself. From the position which it occupied in the MS., being generally written between the lines of the text and on the margin, it was called *glossa interlinearis*. The gloss of the Roman law is written in very poor Latinity, that of the canon law in the Latinity of the mediæval schools.

GLOSSANTHRAX, n. *glŏs'săn-thrăks* [Gr. *glossa*, the tongue; *anthrax*, burning coal]: among *cattle*, a disease characterized by a development of malignant carbuncle in the mouth, especially on the tongue.

GLOSSI'TIS, or GLOTTITIS [fr. Gr. *glossa*, the tongue]: inflammation of the tongue. The disease in its most acute form is rare; it is sometimes due to injury, or to scald; in other cases, to the action of mercury on the system. The tongue becomes enormously swollen, and one of the chief dangers of the attack is suffocation from swelling of the parts about the hyoid bone, and closure thereby of the glottis (see LARYNX). The only effective treatment is to make quite deep incisions into the inflamed part, keeping in view that the resulting wound is likely to be much less than appears at the time; for the enlargement of the organ has stretched the mucous membrane, and infiltrated all the textures with fluid, while the vessels also are distended with blood. A straight bistoury should be boldly plunged into the upper surface, and several incisions made lengthways sufficiently deep to evacuate the confined fluids. A good deal of blood will usually follow, but if care has been taken not to injure the lingual artery or its branches (see TONGUE), there is no real danger from this cause. In places at a distance from medical advice, this operation might require to be performed by unskilled hands, and with a penknife or any other cutting instrument at hand; care should be taken in this case to make the incisions on the upper surface, and not too far from the middle-line.

GLOSSO, *glŏs'sō* [Gr. *glossa*, the tongue]: in *anat.*, a prefix signifying connection with the tongue. GLOSSA'GRA, n. *-să'gra* [Gr. *agra*, a catching]: a rheumatic pain in the tongue. GLOS'SOCELE, n. *-sō-sēl* [Gr. *kēle*, a tumor]: protrusion of the tongue, arising from its tumefaction. GLOSSOCO'MIUM, n. *-kō'mĭ-ūm* [Gr. *komeō*, I guard]: in *surg.*, originally a small case for holding the tongues of wind instruments, afterwards extended to a case or apparatus in which fractured limbs are kept. GLOSSOHY'AL, a. *-hī'al*, lingual. GLOSSOID, a. *glŏs'soyd* [Gr. *eidos*, resemblance]: of or resembling the tongue. GLOSSITIS, n. *glŏs-sī'tĭs*, inflammation of the tongue.

GLOSSOPTERIS, n. *glŏs-sŏp'tĕr-ĭs* [Gr. *glōssa*, the tongue; *pteris*, a fern]: in *geol.*, a genus of oolitic fern—so named from their tongue-shaped leaves; also called *sagenopteris*.

GLOTTALITE, n. *glŏt'tă-līt* [L. *Glotta*, the Clyde; Gr.

lithos, a stone]: a mineral occurring in small aggregated and irregular white or colorless crystals near Port Glasgow, on the Clyde; a silicate of alumina and lime.

GLOTTIS, n. *glŏt'tĭs* [Gr. *glōttis*, the mouth of the windpipe—from *glōtta*, the tongue]: the narrow opening at the upper part of the windpipe (see LARYNX). GLOT'TAL. a. *-tăl*, pertaining to the glottis. GLOTTITIS, n. *glŏt-tī'tĭs*, inflammation of the glottis: see GLOSSITIS.

GLOUCESTER, *glŏs'tėr:* city and port of entry of Essex co., Mass.; on the peninsula of Cape Ann, and on a branch of the B. and M. railroad; 30 m. n.n.e. of Boston. Its harbor, opening into Mass. Bay, is one of the best on the n. e. coast, is accessible for large vessels at all seasons, and is defended by a fort. The city formerly extended over the whole of Cape Ann, but the town of Rockport was set off from the n.e. portion 1840. Its chief industries are connected with the fishery trade and include the building of schooners for fishing and coasting purposes. Next to its fisheries the granite trade is the most important. Extensive quarries exist on the n. side of the cape from which the choicest paving and building stone is obtained. Since 1624 Gloucester has been noted as a fishing station. It was the first place settled by the English on the n. side of Mass. Bay, the fishing business was permanently established 1639, and the settlement was incorporated as a plantation under the jurisdiction of the Plymouth Colony 1642. The fisheries then began to fall off, but in 1700 there was a sudden development of the ship-building industry, owing to the excellent growth of timber on the Cape Ann hills, and about the same time the fisheries were revived with much vigor. In 1720 schooners were built suitable for voyages to the Grand Banks off Newfoundland, and even to foreign cruises. From 1663, when a given quantity of cod and mackerel formed a part of the minister's salary, till to-day, these fish have constituted the chief kind of catch. The revolutionary war stopped the business and it did not revive till 1804. Now about 400 vessels and 3,500 men are employed in the industry, which has an annual value of $4,000,000. Gloucester is connected with Boston by a line of daily steamboats, and its extent of beautiful rocky and wooded shore has become popular for summer residence. Pop. (1910) 24,398.

GLOUCESTER, *glŏs'ter:* English city and county in itself, chief town of the county of the same name, an inland port, cathedral town, watering place, and the seat of important manufactures, on the left bank of the river Severn, w.n.w. from London 107 m. by road, and 114 by rail, and 36 m. n.n.e. from Bristol. Gloucester is clean and well built, with four principal streets, of convenient width, meeting at right angles in the centre of the city. The docks are spacious, and communicate with the open part of the Severn, below Sharpness Point, through a ship canal 17 m. in length, while the wharfs, about 1,000 ft. in length, are directly connected with the several railways. The

foreign trade is principally with the Black and Baltic seas, Canada, W. Indies and France. Gloucester is noted for its salmon and lampreys; it has ship-building yards, iron and brass foundries, and marble and slate-works. The railways of Gloucestershire belong almost entirely to the Great Western and Midland systems; the latter connecting Gloucester with the n., s., and w.; the former, with London and the e., and with Wales. Besides affording a market for the produce of the surrounding districts, Gloucester imports corn, timber, wines, and spirits, has large export trade in iron and steel goods, coal, soap, malt, and potter-ware, railway-fittings, agricultural implements, bells, pins, chemicals, and hempen goods.

The principal building in Gloucester is the cathedral, lately completely restored at a cost of £65,000 to £70,000. It is 427 ft. in length, 154 in width; the height of the central tower, its greatest external ornament, is 223 ft.; the cloisters also, of great beauty, form a large square. Formerly the church of a Benedictine abbey, it was converted into a cathedral 1541. Near it is the new Bishop's Palace. There are more than a dozen Established churches; Wesleyan, Congl., Rom. Cath., and other chapels. The town possesses a grammar-school, theatre, assembly-rooms, shire-hall, town-hall, jail, and lunatic asylum. Gloucester returns one member to parliament. It is noted as one of the three cities (Worcester and Hereford being the other two) at which the musical festivals of the three choirs are alternately held. The history of Gloucester is traceable to a very remote antiquity; it was the Caer Glow of the Britons, Colonia Glevum of the Romans, and an important town in Mercia under the Saxons, by whom it was called *Glean-Ceaster*—whence its present name. Here the celebrated single combat between Edmund Ironsides and Canute is said to have taken place. Gloucester was repeatedly visited by William I., afforded a refuge and support to Queen Matilda in her contest with Stephen, saw Henry III. crowned, and parliaments held under Richard II. and Henry IV., and sided successfully with the parliament in the civil war against Charles I. Robert of Gloucester, metrical historian; Miles Smith, biblical translator; the poet Taylor; and Robert Raikes, promoter of Sunday schools, were natives of Gloucester. Pop. parl. bor. about 50,000.

GLOUCES'TER, Robert of: see Robert of Gloucester.

GLOUCESTERSHIRE, *glŏs'tĕr-shĕr:* county of England, around the lower course of the Severn and the estuary of that river; bounded w. by Monmouth and Hereford, n. by Worcester and Warwickshire, e. by Oxford and Berks, s. by Somerset and Wilts, 804,977 acres. Pop. (1901) 331,-516. The shape of the country resembles a parallelogram; and its outline, still irregular, especially in the n. is much less so than formerly. There are three distinct districts in this county, the natural features of each being different: These are the Hill, the Vale, and the Forest districts; the

first formed by the Coteswold or Cotswold (q.v.) Hills, the second, comprising the vales of Gloucester and Berkeley, by the rich and low meadow-lands along the banks of the Severn; the third, the land w. of the Severn, occupied chiefly by the Forest of Dean. The county is watered principally by the Severn, the Wye, the Upper and Lower Avon, and the Thames or Isis, which receives all the streams on the e. of the Cotswold Hills. The soil is thin on the hills, but produces good pasturage for sheep, while the lower tracts abound in excellent grass and arable lands. Gloucestershire is famous as a dairy county, and raises large numbers of cattle. The famous double and single Glo'ster cheese is produced in the vale of Berkeley. The Forest of Dean, 20,000 acres of which are still crown property, is highly picturesque. From the orchards of Gloucestershire enormous quantities of cider are obtained. Gloucestershire is also a great coal and iron producing county. There are about 100 collieries; The manufactures are numerous and important. The chief is the manufacture of woolen cloth of finer qualities; hats, felt, stockings, pins, cheese-cloths, and other linens are produced in considerable quantities. The county sends five members to the house of commons.

Gloucestershire previous to the Roman invasion, was inhabited by a tribe called the Dobuni; and after that event, the county, or the greater part of it, was included in the province named *Flavia Cæsariensis*. From the earliest Danish invasion till the battle of Tewkesbury 1471, and the civil wars between the crown and parliament, Gloucestershire has been the scene of many and disastrous encounters. It contains numerous Roman relics in camps, roads, coins, fragments of statuary and pottery, tessellated pavements, etc. There are also very numerous traces of British works.

GLOUT, v. *glowt* [Ger. *glotzen*, to look fixedly, to stare (see GLOAT)]: in *OE.*, to look sullen; to view attentively: N. a sullen angry glance.

GLOVE, n. *glŭv* [Icel. *glofi;* AS. *glof*, a glove—from Icel. *lófi*, the palm of the hand: Scot. *loof*, the flat or palm: comp. Gael. *lamh*, the hand; *ceil-lamh*, the covering of the hand]: a covering for the hand, or for the hand and arm, usually with sheaths for the fingers: V. to cover, as with a glove. GLOV'ING, imp. GLOVED, pp. *glŭvd*: ADJ. covered, as with a glove. GLOV'ER, n. *-ėr*, one who makes or sells gloves.—*Gloves* are made of various materials, silk, wool, linen, cotton, fur, and various kinds of leather. Leather is most used, and the mode of making gloves from it is the most characteristic branch of this manufacture. The term 'kid' is a mere technicality, as the annual consumption of leather bearing this name is largely in excess of the possible supply from the skins of all the young goats annually slaughtered: it is made chiefly from lamb's skin. A few of the finest gloves are made from real kid skins, obtained from countries where goats' milk and flesh are articles of food. Dogskin, buckskin, and doeskin gloves are chiefly of sheepskin; some of the thickest leather gloves are of calf-

skin. The leather in all cases undergoes a much lighter dressing than when used for boots and shoes. Worcester is the chief seat of the English leather glove-manufactory; and at Woodstock, a peculiar and superior doeskin glove is made bearing the name of the town. Limerick, Ireland, and its neighborhood has long been celebrated for gloves. Gloversville, N. Y., is the chief seat of the manufacture in the United States.

When the skins are received at the factory they are thoroughly soaked to open out the texture and prepare them for the removal of the hair. Then the skins are placed in vats of lime water, where for two or three weeks the lime works into the flesh and albuminous matter, and loosens the hair. The skins having thus been properly softened, the dirty but picturesque operation of removing the hair ensues. Before each beamer, as the workman is called, is an inclined semi-cylindrical slab of wood, covered with zinc. The skin is first spread upon this, and the broad curved beam of the knife glides across it from end to end, scraping and removing all the loosened hair, the scarf skin, and the small portion of animal matter still adhering to the skin. After unhairing, kid skins must be fermented in a drench of bran, whose purpose is to completely decompose the remaining albuminous matter, and also to remove all traces of the lime. The operation is extremely delicate.

With the preparation of kid leather, alum is the astringent curative agent. Its operation is accompanied by that of others, whose purpose is to secure elasticity, and pliability, and mainly to preserve that beautiful texture which makes kid leather superior to all others. These assistants in the process are eggs, flour, and salt. They are combined into what is called a custard, and there is certainly nothing repulsive in the idea of such a delicate agent being used. A proper quantity of the custard and a number of skins having been put together in a dash-wheel, where they are thrown about for some time, opens the pores of the skin, absorbs the custard freely, and becomes swelled by the chemical union of the custard and the skin. This having progressed satisfactorily, the skins are folded together with the fleshy side outward, and are dried by a gentle heat. They are now cured, but they are yet hard and rough. The breaking and 'staking,' as they are called, are now resorted to, to make the skins soft, pliable, and of even texture, removing the superfluous chemicals with which they have become charged, and the stiffness by manipulating the fibres. The operation of transforming the skin into leather is now finished, but age is necessary to secure perfect pliability and softness. The skins are therefore laid away to let the slow chemical operation going on within them be completed. After this has been accomplished the skins are ready for dyeing, cutting, and manufacturing.

Calf skins as well as horsehides are used in the manufacture of workingmen's gloves. They are tanned in two

ways, namely, oil tan, with a preparation that makes them what is called 'fire and water proof,' and they are also dressed and have the same finish as the buck glove.

In the dye-rooms the skins which have already been aged are immersed in dye vats, where the delicate colors are imparted to them. The same care is not required in obtaining the ordinary range of dark colors, for these are 'brushed' on, the skin being spread upon a glass slab and the dye being painted on with a brush. After they are dyed the skins are sometimes somewhat hard, and some classes have to be staked again in order to restore their pliability. The finishing touches to a kid skin are secured by rubbing the grain side over with a 'size', which imparts a gloss. The experience of Gloversville manufacturers with buck gloves has enabled them to impart a special finish to a skin the same as the suède finish, which is very popular under the title of 'mocha.' This is the same as suède finish, which is produced in other countries, by shaving off the grain side of the skin at an early stage of its progress. The Gloversville method is much better, however, and has more perfect results. Here the grain is removed, and the velvet finish secured by buffing the surface on an emery wheel. The surface of the leather is cut away in minute particles by this process, and the result is an exceedingly even and velvety texture, superior to that obtained by other methods.

The concluding work is as follows: A marble slab lies before the cutter on a table, and every particle of dirt or other inequality is removed before 'doling.' The skin is spread, flesh side up, upon the slab, and the cutter goes over it with a broad-bladed chisel or knife, shaving down inequalities and removing all the fibrous portions. The dexterity with which this is done makes the operation appear extremely simple, but any but a skilled and experienced operative would almost surely cut through the skin. The most delicate part of the glove-maker's art, in which exact judgment is required, comes in preparing the 'tranks' or slips from which the separate gloves are cut. The trank must be so cut as to have just enough leather to make a glove of a certain size and number. The operation would be easy enough if the material were hard and stiff, and if the elasticity were uniform, but this is rarely the case.

The gussets, facings, etc., are cut from the waste leather in the thumb opening at the same operation. In olden times an outline was traced upon the leather and the pattern was cut with shears. Modern invention has produced dies and presses, which are universally used. Similar dies are used in the cutting of the thumb pieces and forchettes or strips forming the sides of the fingers.

The gloves are somewhat unsightly as they come from the sewer's hands, and must be made trim and neat. To secure these desirable results the gloves are taken to the 'laying-off' room. In this are long tables with a long row

of brass hands projecting at an acute angle. These are filled with steam and are too hot to touch, but by ingenious devices they are so arranged that it is impossible to burn the glove or stiffen the leather by too much heat, a common defect in ordinary methods. The operation of the 'laying-off room' is finished with surprising quickness. Before each table stands an operator, who slips a glove over each form, draws it down to shape, and after a moment's exposure to the warmth, removes it, smooth, shapely, and ready for the box.

About the year 1880 a skin called 'mocha' was utilized, and has been ever since, in making fine gloves, and they are finished similar to the suède finish, giving them a very velvety appearance. They are very soft and pliable, and in fact have been almost as popular as the fine kid and lamb gloves. These mocha skins are all gathered in Arabia.

GLOVER, *glŭv'er,* RICHARD: 1712–85; b. London. He was educated at Cheam, in Surrey; was a merchant in London, and 1760 became a member of parliament for Weymouth. His first poem, to the memory of Sir Isaac Newton, was written in his 16th year. His chief poem, entitled *Leonidas,* was published 1737, and passed through several editions: a continuation, the *Atheniad,* was published 1787. These poems are in blank verse, and of prodigious extent, and though not without elevation of tone, they are in the main heavy, and are now almost forgotten.

GLOVERSVILLE, *glŭv'ėrz-vĭl:* city of Fulton co., N. Y., on Cayadutta creek, and the Fonda, Johnstown and Gloversville railroad; 44 m. n.w. of Albany. It was incorporated as a village in 1851 and chartered as a city in 1890. It contains several churches, graded and primary schools, banks, a public library, weekly newspapers, the Nathan Littauer Hospital, and nearly 200 establishments which manufacture two-thirds of the kid and buckskin gloves made in the U. S. This industry, from which the town derives its name, was begun 1803. Besides gloves and mittens, there are manufactories of various kinds. Pop.(1910) 20,642.

GLOV'ER TOW'ER: see SULPHURIC ACID.

GLOW, n. *glō* [Icel. *gloa,* to glow: *glod,* live coal; Ger. *glühen,* to be red-hot: Dut *gloed,* hot coals]: brightness of color; redness; shining heat; passion: V. to shine with heat; to be red or flushed, as with heat or animation; to feel heat. GLOW'ING, imp.: ADJ. burning with vehement heat and shining; ardent; animated; inflamed: N. act or condition of that which glows. GLOWED, pp. *glōd.* GLOW'INGLY, ad. *-lĭ.*

GLOW'WORM: popular name for the wingless females of certain coleopterous insects of the family *Lampyridæ,* remarkable for the luminosity of some of the last segments of the abdomen. The insects of the family *Lampyridæ* have five joints in all the *tarsi,* the antennæ toothed, the elytra (wing-covers)—at least of the males—cover-

ing the whole abdomen, the whole body soft and the elytra flexible, the females often destitute both of wings and elytra, the thorax projecting over and almost concealing the head. When seized, they place their feet and antennæ close to the body, many of them also curving the abdomen downward, and simulate death. The Common Glowworm (*Lampyris noctiluca*) is abundant in parts of England. The antennæ are short. The male has very large eyes. The female, which is larger than the male, is fully half an inch in length, of a blackish color, the legs dusky red, and the thorax and abdomen margined with that color. The female is destitute of wings and elytra. The habits of the insect are nocturnal. The male emits a faint light, the female a soft but strong light, of which the use is supposed to be to attract and guide the male. The female glowworm is generally to be found, during the summer months, among grass or on mossy banks. There is reason to think that the glowworm has the power of displaying and extinguishing its light at pleasure, so that it may not be unnecessarily exposed to enemies; but if the luminous portion of the abdomen be removed, it retains its luminosity for some time. If placed in hydrogen gas, it sometimes detonates. The luminous matter is capable of being mixed with water, and warm water increases its brilliancy. Two spots on the last segment of the abdomen are more luminous than any other part, and a constant motion of this segment seems to be connected with the emission of the light. The two segments next to this are each surrounded by a band brighter than the rest of the segment. The larva of the glowworm is very similar to the perfect female insect, but is very faintly luminous. It is very voracious, attacking and devouring snails, whereas the perfect insects eats little, and is supposed to prefer the tender leaves of plants.—Several species of glowworm are found in the warmer parts of Europe, and in other parts of the world. The luminosity of the males of the genus *Lampyris*, and of other winged insects of the family *Lampyridæ*, has obtained for them the name of fireflies (q.v.): see also Coleoptera.

GLOXINIA. n., *glŏks-ĭn′ĭ-ă* [after the botanist *Gloxin* of Colmar]: a splendid genus of plants, ord. *Gesnĕrācĕæ*.

GLOZE, v. *glōz* [AS. *glesan*, to explain, to flatter: a corruption of Gloss 2, which see]: to flatter; to wheedle; to talk smoothly: N. flattery; insinuation. Glo′zing, imp. Glozed, pp. *glōzd*. Glo′zer, n. *-zėr*, one who.

GLUCINA, n. *glô-sī′nă*, or Glucin, n. *glô′sĭn*, also Glycina [Gr. *glukus*, sweet: F. *glucine:* named from its salts having a sweetish taste]: the oxide of glucinum (q.v.), GlO. It was first ascertained to be a new earth by Vauquelin, who in 1798 obtained it from beryl, and pointed out that it differs from alumina in several important ways, notably in the fact that it does not form an alum.

Glucina is a white, loosely coherent powder without taste or smell. It is infusible, but volatilizes at a very high temperature.

GLUCINUM, *glô-sī′nŭm*, a metallic element which occurs in the minerals beryl, chrysoberyl, phenacite, and euclase. The name 'beryllium' was assigned to it on account of its occurrence in the beryl, and the name 'glucinum' on account of the sweetish taste of its salts. Its chemical symbol is sometimes taken as Be, and sometimes as Gl. Its atomic weight is 9·08 and its specific gravity (when compressed) about 1·85. It resembles steel in general appearance, and forms hard, hexagonal crystals which are unaffected by air at ordinary temperatures, and which are scarcely affected by oxygen or sulphur, even at a red heat, though when heated in chlorine the metal burns to the chlorid, $GlCl_2$. It dissolves readily in hydrochloric acid. Sulphuric acid and caustic potash or soda also dissolve it, but nitric acid, even when hot, and concentrated, acts upon it very slowly. Glucinum forms many salts, but the metal and its compounds are of interest only to the chemist as they are not used for any purpose in ordinary life.

GLUCK, *glûk*, Christoph Willibald von: 1714, July 2—1787, Nov. 25; b. Weidenwang, in the Upper Palatinate: German musical composer, who may be considered the father of the modern opera. (The name is often improperly spelt Glück.) He learned the rudiments of music in one of the common schools of Prague, and as a wandering musician went to Vienna, where he found opportunity to master the rules of counterpoint and harmony. In 1738, he went to Italy, and found a worthy master in San-Martini. After four years of study he wrote his first opera, *Artaxerxes*, performed at Milan, 1741. This was followed by *Ipermnestra* and *Demetrio*, given at Venice, 1742, and several others in the next two years, produced at Milan and Turin, having achieved high reputation, Gluck was invited to London, where his *Fall of the Giants* was represented 1745. He found a formidable rival in Handel, whose genius he honored, and he derived advantage from the friendship of Dr. Arne, English composer. Here he began to develop the full force of that lyric genius destined soon to create a new order of musical composition; but the outbreak of the Rebellion in Scotland closed the opera, the singers and musicians being mostly Rom. Catholics, and Gluck returned to Vienna. In 1754, he was called to Rome, where he wrote *La Clemenza di Tito*, *Antigono*, and several others. But he did not rise to that style of art which distinguished his later works until he found at Florence, in Ranieri di Calzabiga, a poet whose dramas were worthy of his music. He then composed the three operas, *Alceste*, *Paride e Elena*, and *Orfeo*, which became the foundation of an imperishable fame. He made music the interpreter of poetry, giving it the fullest expression. His simple, noble, and grand style filled Europe with admiration. He changed no less the action of the stage than the music. Before his time all had been artificial and insipid: he made everything natural and effective. At Paris, 1777,

be became the rival of the great Italian composer Piccini, and the city was divided into two rival factions of the Gluckists and the Piccinists. He conquered with his *Iphigénie en Tauride,* 1779. Piccini, who had composed an opera on the same subject, would not allow his to be performed after listening to that of his rival. His great triumph was followed by several successful works, and he enjoyed the highest patronage and prosperity. Burney characterized him in a single phrase, 'the Michael Angelo of music.'

GLÜCKSTADT, *glük'stât:* town in Prussian province of Slesvig-Holstein, on the right bank of the Elbe, on the Kremper Marsh, 32 m. below Hamburg. It is a pretty town, regularly built, and intersected by canals. The chief buildings are the high school, the school of navigation, the house of correction, the workhouse for Slesvig-Holstein, and the theatre. It has a safe port capable of containing 200 ships, and furnished with wharfs. The water with which the town is supplied requires to be gathered into cisterns and artificially purified. Weaving is carried on; but trade, navigation, and whale-fishing employ the inhabitants chiefly. Glückstadt was founded 1620 by Christian IV. of Denmark, fortified, and endowed with various commercial privileges. During the thirty years' war, it successfully withstood three sieges; its fortifications were demolished 1815. Pop. 6,000.

GLUCOSE (grape sugar, dextrose): a very widely distributed organic compound, belonging to the class of Monosaccharides or of simple sugars. It is constituted of carbon, hydrogen and oxygen, the latter elements being in the proportion in which they exist in water, that is, two atoms of hydrogen to one of oxygen; hence the general term Carbohydrate, formula of Glucose, $C_6H_{12}O_6$. Found in the juice of grapes, and when the grapes are dried in the preparation of raisins, the glucose is deposited in hard masses. It is generally found associated with another sugar of like composition, known as levulose (the two together constituting a mixture called invert sugar), in many sweet fruits, in some leaves and roots, and in honey. From an alcoholic solution of invert sugar, glucose can be obtained in quite pure condition, by crystallization, the more soluble levulose remaining in the solution. It crystallizes from water or dilute alcohol, with one molecule of water, its melting point being 86° C.; melting point of anhydrous crystals 146° C. very soluble in water, but almost insoluble in absolute alcohol. It is considerably less sweet than cane sugar; its solution has a dextro-rotatory action upon polarized light, to which fact the name dextrose refers.

Glucose is formed from several of the carbohydrates by the process known as hydrolysis (the appropriations of the elements of water), effected through the agency of enzymes (unorganized ferments), or by boiling with dilute sulphuric acid. The formation from cane sugar, which is a poly-

saccharide or complex sugar, is shown in the following equation:

$$C_{12}H_{22}O_{11} + H_2O = C_6H_{12}O_6 + C_6H_{12}O_6.$$

Cane Sugar Water Glucose or Dextrose Fructose or Levulose

It is here seen what there is in a breaking up of one molecule of cane sugar into two molecules of identical composition, one glucose, the other fructose or levulose, the mixture being invert sugar, already mentioned.

The manufacture of glucose is a very extensive industry. Dilute acids effect the change of starch into glucose—at first this is associated with dextrin and maltose, but as the operation is continued, these diminish in quantity, until at last, glucose is the sole product. The conversion is accomplished in vessels sometimes open, sometimes closed. The open converters are wooden vats generally of three thousand to four thousand gallons capacity, and serve to treat the starch from one thousand bushels of corn. The heating is brought about by steam in copper steam-coils. Sulphuric acid is generally used, the amount varying with the measure of completeness of the conversion required. The proportion is from a half pound to a pound and a quarter oil of vitriol (commercial sulphuric acid) for every hundred pounds of starch. The boiling of the mixture of starch, acid and water is continued until the iodine test fails to respond with a blue color but shows a dark cherry instead.

The closed converters are wood or copper vats provided with safety valves, and made to stand six atmospheres of pressure; the contents are boiled under pressure of three to five atmospheres. The conversion is much more rapidly effected in the closed than in the open vessels. When the conversion has been completed to the desired extent, the liquor is run into the neutralizing vats, and treated with marble dust, which with the sulphuric acid produces sulphate of calcium; at the same time bone black and sulphurous acid are used as bleaching agents. Concentration is then effected in a vacuum pan at temperature of about 140° F. down to a certain density, when it is filtered to remove the sulphate of calcium, and then again through bone black to complete the decolorization and purification. The concentration is then continued until it reaches 40° to 42° Baumé. The product which now remains liquid is called 'Glucose' in commerce; that which solidifies is known as 'Grape-sugar.' The 'glucose' is mixed with much dextrin, in consequence of incomplete conversion. The longer the operation is continued the less is the dextrin content, and the greater the glucose.

Another illustration is given, as it involves the particular reaction which is so extensively used in the manufacture of the commercial products known as 'glucose' and 'grape-sugar.'

Starch may be represented by the formula $(C_6H_{10}O_5)_n$—using the simple form $C_6H_{10}O_5$, we may represent the reaction:

GLUCOSE.

$$C_6H_{10}O_5 + H_2O = C_6H_{12}O_6$$
Starch Glucose

Glucose like many other monosaccharides or simple sugars, readily undergoes fermentation with yeast (saccharomyces). The chemical change involved, is generally presented thus:

$$C_6H_{12}O_6 = 2C_2H_6O + 2CO_2$$
Glucose Alcohol Carbon dioxide

As all alcoholic drinks (ales, wines, and spirits) are obtained from fluids containing this variety of sugar as the essential constituent, and as their value depends mainly on the amount of sugar present, it is very important to have some ready means of determining its amount. A similar determination is of great value in reference also to the urinary secretion in diabetes (q.v.) as it is mainly by ascertaining whether the daily amount of excreted glucose is diminishing or increasing that we can trace the favorable or unfavorable progress of the case.

Without entering into details, we may mention that there are three different modes of determining the amount of glucose in a fluid: the first is by determining the specific gravity; the second is the optical test, based upon the fact (above noticed), that solutions of sugar (grape, cane, or milk sugar) exert right-handed rotation upon a ray of polarized light, the angle of rotation being proportional to the percentage of sugar.

The third is by chemical means, of which the most important are Barreswil's method and the fermentation test. Barreswil's method is based upon the property which glucose possesses of throwing down suboxide of copper from alkaline solutions of oxide of copper. For the fermentation test, we take a given quantity of the saccharine fluid, add a little well-washed yeast, and collect the carbonic acid that is evolved over mercury. Roughly speaking, a cubic inch of carbonic acid corresponds to a grain of sugar.

It was in 1792 that Lowitz announced that there was other than cane-sugar, he having obtained dextrose, a different variety, from grapes. In 1811 dextrose was obtained from starch by the action thereon of dilute sulphuric acid. By similar process Braconnot, in 1819, obtained it from linen rags, sawdust, or other vegetable fibre. During the reign of Napoleon Bonaparte starch-sugar was made to make good the deficiency which the continental blockade caused in the supply of cane-sugar. Early in the 19th century it was made from potato-starch in Germany, and during the latter half in France. From 1825 to the present time the chemists of France, Germany, and the United States have studied to improve processes, bnt nowhere in the world is glucose made so perfectly and at so low a cost as in the United States, where raw material is cheap, and the processes of manufacture so perfected that this country is fast meeting the European demand for glucose and causing the industry to dwindle in continental Europe. This country can manufacture glucose, send it to Europe, pay a 30 per cent tariff, and then undersell the makers of Europe,

the proof of which is the published statements, showing the exports of glucose from the United States. From 1838 the number of factories in France and Germany increased until 40 years later there were 85, and in the Austrian empire, where the industry began about 1840, or a few years earlier, over 100.

The manufacture of glucose or grape-sugar from starch has been a prominent American industry for about 40 years.

In 1884 there were 29 factories engaged in the manufacture of sugar or syrup from corn and having a combined capacity for absorbing 40,000 bushels of corn per day. At present there are at least five factories which use an average of 175,000 bushels of corn every day. The process of manufacture has been greatly improved, so much so that, while in 1882 26 to 30 pounds of glucose was obtained from one bushel of corn, 40 pounds is now obtained.

Because glucose does not crystallize, it is used extensively in the preserving industry. Fruit put up in a syrup wholly or partially made of glucose has a more plump and natural appearance than if preserved in sugar. Comb-honey, when put into glass jars, is surrounded by glucose, which does not change in color or character, and therefore the honey always remains pleasing to the eye. It is very largely used for mixing with cane-sugar molasses; in the manufacture of table-syrup; as a substitute for malt in brewing; and very freely in the manufacture of candy. It is said to have from one-half to two-thirds the sweetening power of cane-sugar. The extent to which glucose is used in the making of jams, jellies, marmalades, preserves, and canned fruit, together with tables showing the composition of commercial glucose and the composition of the ash of glucose, has recently been stated in Bulletin No. 66, Bureau of Chemistry, United States Department of Agriculture; also with extensive tables showing the composition of the jams and other preserves in comparison with such as contained no glucose. This bulletin was prepared under the direction of W. D. Bigelow, chief of food laboratory.

Glucose is very largely used in the manufacture of confectionery. Some candies are nearly all glucose, particularly such as are sold for a penny. In the high-grade confections the finest grade is used, not as a substitute for sugar, but in the place of cream of tartar to kill or soften the grain of sugar, for which purpose only a small quantity is used. It is also used as a substitute for malt in the brewing of ale or beer, it being claimed that a lighter beer results than when pure malt is used, and that it is more palatable. It is assumed that commercial glucose is the same as the glucose which comes from the action of diastase in changing the starch in malt into maltose sugar. By using glucose direct, trouble and expense are saved to the brewer, as he is not compelled to use cereals which are, in the process of the brew, converted into glucose or grape-sugar. It is

claimed that 100 pounds of glucose or grape-sugar is equal to 123 pounds of barley-malt, and is much cheaper. Various publications of the United States Department of Agriculture and the reports of Congressional committees contain a great deal of information on the use of glucose in brewing.

The wholesomeness of glucose is really the most important question connected with glucose, and one that is still unsettled. It is a problem for the physiologist rather than the chemist.

GLUCOSIDES, *gloo'kō-sīdz*, a large class of substances occurring in plants, which are distinguished by decomposing under the influence of ferments, acids, and alkalies into sugar and usually one other substance the nature of which differs with different plants. The composition of the glucosides varies, sometimes nitrogen is present, but in general the compound consists only of carbon, hydrogen, and oxygen. Their constitution is practically unknown. When decomposed by the agents above mentioned they assimilate water, and usually yield glucose or dextrose, but some glucosides furnish other kinds of sugar. Amygdalin was the first known Glucoside.

GLUCOSURIA: see GLYCOSURIA.

GLUE, n. *glô* [F. *glu*, bird-lime—from L. *gluten*, glue or paste: W. *glud*, tenacious paste]: a tenacious jelly made from the parings of the skins, hoofs, etc., of animals, and used as a cement. V. to join or unite by means of glue; to stick or hold fast; to join. GLU'ING, imp. GLUED, pp. *glôd*. GLUEY, a. *glô'ĭ*, tenacious like glue. GLU'EYNESS, n. *-ĭ-nĕs*.

GLUE, an impure gelatine, used as an adhesive, and commonly prepared from the clippings of hides, hoofs, horns, and sinews. These are steeped in lime-water, to remove the hair and blood, and then drained and dried in a current of air, that the lime may absorb carbonic acid, and thus prevent the injurious effects of the alkali upon the gelatine. The dippings are then boiled in water until the solution is found to gelatinize firmly on cooling. The impurities are allowed to settle and the residuum to gelatinize in shallow wooden boxes; it is then cut into slices and dried upon nets. Good glue is semi-transparent and free from spots and clouds.

The glue industry in the United States was founded by Peter Cooper in 1827, when he established a factory in Brooklyn. About the same time a factory in Philadelphia was started by Charles Baeder and William Adamson. At present glue factories are centralizing near the great slaughter houses of the Middle West, the sources of raw supplies, and the larger packing concerns have their own glue plants. The export trade is steadily growing and has passed the $500,000 mark per annum. France alone surpasses America in the quality of its finer glues, and these are imported for use in making straw hats.

GLUE, MARINE: cementing composition used in shipbuilding, and for other purposes, where the materials are

exposed to the influence of wet. It consists of india-rubber cut very small—one part digested at a gentle heat in a closed vessel with 12 parts of mineral naphtha until it is dissolved, then 20 parts of powdered shellac are added, and the digestion continued until it also is dissolved. During both stages of the process, the mixture must be stirred or shaken occasionally. It requires to be liquefied by heat before using, and must be quickly applied, as it very soon hardens. It is valued particularly for its power to cement not only wood, but glass and metals, and to resist the action of moisture. Its employment, however, requires care and skill.

GLUM, a. *glŭm* [Ger. *glumm*, gloomy: Scot. *glum*, a sour, cross look: prov. Sw. *glomma*, to stare (see GLOOM)]: sullen; stubbornly grave. GLUM'MISH, a. *-mĭsh*, somewhat glum; gloomy. GLUMP, v. *glŭmp*, in *familiar language*, to show sullenness by manner; to be sullen. GLUM'PY, a. *-pĭ*, sullen.

GLUME, n. *glôm* [L. *gluma*, the husk of corn: F. *glume*] in *bot.*: small bract or scale, in the axil of which there grows either a single flower destitute of perianth, as in the *Cyperaceæ*, and in some of the grasses; or, as in others of the grasses, a *spikelet* composed of a number of flowers (*florets*): it is the husk formed of flaps or valves embracing the seed. The Grasses (*Gramineæ*) and *Cyperaceæ* are sometimes conjoined under the appellation *Glumaceous Plants*. GLUMOUS, a. *glô'mŭs*, having a glume. GLUMA'CEOUS, a. *-mā'shŭs*, resembling the dry scale-like glumes of grasses. GLUMIF'EROUS, a. *-mĭf'ėr-ŭs* [L. *fero*, I bear]: bearing or producing glumes. GLUMELLE, n. *glô'mĕl*, also GLUMEL'LULE, n. *-mĕl'ūl* [dim. of *glume*]: the inner husk of the flowers of grasses—also GLUMELLA, n. *glô-mĕl'lă*, GLUMELLÆ, n. plu. *-lē*, the paleæ or fertile glumes of grasses.

GLUT, v. *glŭt* [a word imitative of the sound, and represented by such syllables as *glut*, *glop*, *glup*, *gulp*, etc.: *glut glut*, the noise of a liquid escaping from a narrow-necked opening: L. *glūtĭō*, I swallow: comp. Gael. *glut*, voracity (see GLUTTON)]: to swallow greedily; to gorge; to fill or to be filled beyond sufficiency: N. superabundance; more than enough—as, there is a *glut* in the market; anything which obstructs a passage. GLUT'TING, imp. GLUT'TED, pp.

GLUTEN, n. *glô'tĕn* [F. *gluten*—from L. *gluten*, paste or glue: It. *glutine*]: a tough substance obtained from wheat and other grains containing fibrin and gliadin; in *wax-painting*, a compound made of wax and copal, with an essential oil with which the pigments are mixed. GLU'TENOID, a. *-oyd* [Gr. *eidos*, resemblance]: resembling gluten or allied to it. GLUTIN, n. *glô'tĭn*, the part of crude gluten which is soluble in alcohol—preferably known as gliadin. GLU'TINATE, v. *-tĭ-nāt* [L. *glūtĭnātus*, glued together]: to unite with glue; to cement. GLU'TINATING, imp. GLU'-

TINATED, pp. GLU'TINA'TION, n. *-nā'shŭn*, the act of uniting with glue. GLU'TINATIVE, a. *-nā-tĭv*, having the quality of gluing or cementing. GLU'TINOUS, a. *-tĭ-nŭs*, [L. *glūtĭnōsus*, gluey]: tenacious; covered with slimy moisture. GLU'TINOUSNESS, n., or GLU'TINOS'ITY, n. *-nŏs'ĭ-tĭ*, the quality of being glutinous; tenacity.

GLUTEN: one of the most important constituents of the varieties of cereals used as food. It is obtained by mixing flour with water, and thus forming a paste or dough. This paste is placed in a bag of fine linen, and kneaded in water, which must be repeatedly changed, till it ceases to assume a milky appearance. A gray, tenacious, viscous, tasteless albuminous substance, having the appearance of birdlime is left in the bag. This substance consists mainly of gluten, mixed with traces of bran starch and of oily matter. The gluten thus obtained from wheat and from rye is far more tenacious than that from the other cereals, and it is the great tenacity of this constituent that especially fits these flours for conversion into bread. The proportion of gluten in wheat flour varies greatly, according to climate, soil, temperature, etc. It is found by analysis, that the proportion in wheat grown in Algeria and other hot countries is considerably higher than in wheat grown in England, or still colder countries; and the hard, thin-skinned wheats contain more of this ingredient than the softer varieties of the grain. It forms about 16 per cent. of Algerian wheat; abt. 15 per cent. of wheat from the Black Sea; and nearly 14 per cent. of S. Carolina wheat; about 10·7 per cent. of English wheat; 9·8 per cent. of Canadian wheat; and less than 9 per cent. of Danzig wheat.

Gluten in a moist state rapidly putrefies, the mass acquiring the smell of decaying cheese; but when dry, it forms a hard, brownish, horny-looking mass, that does not readily decompose. It is a vegetable proteid (a nitrogen-containing compound), insoluble in water, soluble in strong acids and alkalies, soluble also, but more slowly, in a weak hydrochloric acid, 0·2 p.c. Gluten treated with hot alcohol, resolves itself into at least two distinct substances, one soluble, the other insoluble in that fluid. The insoluble portion is called by Ritthausen vegetable fibrin. It is a gray, tough, elastic substance, insoluble in water or in ether, but readily soluble in dilute alkalies, from which it is precipitated by neutralization with acetic acid. It is soluble also in very dilute hydrochloric acid, from which it is thrown down by the neutral salts. The soluble portion is in part precipitated from the alcohol on cooling, in the form of flakes, the so-called mucedin or vegetable mucin; while a third substance remains in solution, giving to the alcohol a syrupy consistence. It separates, on the addition of water, as a white substance resembling albumen. It is usually known as *gliadin*, or vegetable gelatin. All these constituents of gluten contain carbon, hydrogen, nitrogen, oxygen, and sulphur, in much the same proportion as the animal albuminates

or proteine bodies, and they all doubtless belong to the flesh-forming group of foods.

The action of gluten in the manufacture of bread is probably double; it induces, by constant action, an alteration of the starch, and subsequent fermentation. An anrylotic action, converting the starch, first into dextrin, and then into dextrose; while by its tenacity it prevents the escape of carbonic acid gas. In the moist state, gluten weighs three times as much as when dry.

Martin has shown that gluten does not exist in flour as such, but is due to the action of water (and possibly ferments) upon certain proteids, pre-existent in the flour.

The flours of barley, rye and oats contain only traces of gliadin, and in consequence cannot make as tenacious a dough as wheat flour; they are therefore not as convenient for bread-making. Gluten does not exist in leguminous seed. It is present in the juices of grapes and other fruits, probably held in solution by tartaric acid or other organic acid.

GLUTEUS, n. *glô-tē′ŭs* [Gr. *gloutos*, the buttock or hip]: one of the three large thick muscles on which the human form rests in sitting. GLUTE′AL, a. *-tē′ăl*, pertaining to the buttocks.

GLUTTON, n. *glŭt′n* [OF. *gloton* and *glout*, a glutton. F. *glouton*, ravenous—from mid. L. *glūtōnem:* W. *glwth*, gluttonous: Norw. *glupa*, to swallow: L. *glūtĭō*, I swallow (see GLUT)]: one who eats to excess; one who gorges or stuffs himself with food; a carnivorous mammal about the size of a large badger. GLUTTONOUS, a. *glŭt′n-ŭs*, given to excessive eating. GLUT′TONOUSLY, ad. *-lĭ*. GLUTTONY, n. *glŭt′n-ĭ*, excess in eating; voracity of appetite.

GLUT′TON (*Gulo*): genus of quadrupeds usually referred to the bear family (*Ursidæ*), but which constitutes an interesting connecting link between that and the weasel family (*Mustelidæ*), agreeing more nearly with the latter in dentition, though approaching the former in the plantigrade character. There are three false molars in the upper, and four in the lower jaw, anterior to the carnivorous tooth, which is large and sharp. The body is long, the legs are short, the feet have each five deeply divided toes, terminated by long curved claws. The tail is rather short, a fold beneath the tail supplies the place of the glandular pouch of the badgers; but when hard pressed by enemies, the gluttons emit a peculiar fluid of a strong musky odor. Their habits are nocturnal. The species commonly called GLUTTON, also WOLVERENE (*G. arcticus*), is a native of the n. parts of Europe, Asia, and America. It is more common in the arctic regions than toward the s. limits of its distribution, which in Europe are about the forest of Courland, and in America the mountainous parts of Massachusetts. It is about two ft. six inches or two ft. nine inches in length, from the tip of the nose to the root of the tail; the tail about seven or eight inches long, both body and tail covered with long

hair, under which the body is covered with a rich, thick fur. The general color of the long hair is brown, sometimes approaching to black, lighter bands passing from the neck along the flanks, and meeting at the tail. The short fur is chestnut brown. The muzzle is black. A light-brown band runs across the forehead from ear to ear. The fur of the glutton is sometimes of considerable value, and is used for muffs, cloaks, etc., but varies not a little in glossiness and other qualities. Extraordinary stories were formerly credited concerning the ferocity, voracity, and cunning of this animal, and have not altogether disappeared from books of natural history. It is very capable of domestication, and even in a wild state shows no remarkable ferocity; nor is there any reason to believe that it leaps from trees on deer, or pursues any of those artful methods of procuring food which have been ascribed to it. It often preys on animals which it has not itself killed. The smaller quadrupeds are its principal food, and it devours young foxes in great numbers. Its speed is not great, but it excels in strength and perseverance. The traps set for the smaller kinds of animals in the fur countries of N. America are often robbed by the wolverene, and it has been known to remove a great pile of wood, to obtain provisions hidden under it.—Closely allied to the glutton are the grison and the ratel. Bone-caverns and some of the newest deposits exhibit remains of more than one species of glutton.

GLYCE'RIA: see Manna Grass.

GLYCERIDES, n. plu. *glĭs-ĕr'ĭ-dēz* [Gr. *glukus*, sweet; *eidos*, resemblance]: a general term for compound fatty substances which, when acted on by water, are resolved into the sweet substance *glycerine*, and the fatty acids, *stearic*, *palmitic*, *oleic*, etc.

GLYCEROL, or Glycerine, or Glycerin [Gr. *glukus*, sweet: termination, *-ol* signifying alcohol, in the chemical sense of that term]: a sweet, thick, colorless liquid, found in combination in fats and oils, from which it is prepared by saponification. Fats and oils are esters or ethereal salts of glycerol with acids, most usually with stearic, palmitic and oleic acids; when these ethereal salts are decomposed by boiling, as in soap-making, with alkalis, glycerol and alkali salts are formed, the latter being the soap. In like manner, if sulphuric acid, or water in the form of super-heated steam, is made to act upon the fats, glycerol and the fatty acids are produced, a result chemically identical with the foregoing. Again, the action of lead oxide on fats when boiled together with a little water, leads to a similar result, glycerol and the lead salts of the fatty acids (lead plaster) being formed. Glycerol is produced in small quantity in the alcoholic fermentation of sugar; it is therefore present in wine. Other methods, strictly chemical, for the formation of glycerol, are known; one of these, interesting because it gives an insight into the constitution of the compound, is the heating of glycerol

tri-chloride with water to 170°. The action may thus be represented $C_3H_5Cl_3+3H_2O=C_3H_5(OH)_3+3HCl$. The formula for glycerol $C_3H_5(OH)_3$ may be written $CH_2OH-CHOH-CH_2OH$, indicating that the three hydroxyls (OH) are in combination, one with each of the three carbon atoms in the molecule. As there are three hydroxyls connected with the hydrocarbon radical, C_3H_5, the compound is called a tri-atomic alcohol.

Historical.—Scheele discovered glycerol in 1784 when making lead plaster by saponifying olive oil with litharge (lead oxide). Chevreul in 1811 demonstrated the chemical constitution of the fats and shewed the part played therein by glycerol, and its analogy to alcohol; its composition and the explanation of its constitution, were worked out subsequently, by Pelouze, Berthelot and Wurtz.

Glycerol is a colorless, viscid, neutral liquid, of sweet taste, miscible in all proportions with water, alcohol and chloroform, but very slightly soluble in ether. Its specific gravity is 1.27; it solidifies when strongly heated, to crystals like those of sugar candy, which melt at 20° C. It boils at 290° C., but when impure, it can be distilled without decomposition only under diminished pressure; it absorbs water with great avidity.

Glycerol undergoes numerous chemical reactions, a few of which may be noted. Its hydroxyl hydrogen may be wholly or in part substituted by a metal, forming soluble alcoholates, which are easily decomposed; or the same hydrogen may be replaced by a hydrocarbon radical, when an ether would be produced; again as an alcohol it may form very varied ethereal salts, thus with sulphuric acid the easily saponifiable glycerol-sulphuric acid; with phosphoric acid, glycerol-phosphoric acid, with nitric acid, nitro-glycerin; with hydrochloric acid, the chlorhydrins, and with the higher fatty acids, the fats. By the separation of two molecules of water, it yields acrolein, a substance whose vapor is very acrid and irritating to the mucous membranes, particularly of the nose and eyes. Oxidizing agents convert it into different acids, according to circumstances. When, however, a mild oxidizing agent is used, other products may be formed, as for instance, when bromine in presence of an alkali is used, a substance is obtained, known as glycerose, a syrup which undergoes fermentation, and reduces alkaline solutions of copper salts, acting thus like many sugars. It is shown to be a mixture of two substances, glyceric aldehyde and dioxy-acetone, which are considered to be true sugars, and which when treated with caustic soda, unite to form another sugar, inactive fructose.

A borax bead after dipping into glycerin, colors a flame green. This, and the acrolein test already mentioned, are perhaps the most ready means for the identification of this substance.

The applications of glycerol are numerous. In medicine it is used as a healing ointment for external use, and as a solvent for many drugs taken internally. It is a

valuable preservative fluid for small and delicate anatomical preparations; it is used in perfumery, in the manufacture of liquors, fruit preserves, wine, etc., in calico printing and in the preparation of leather. Large quantities are required in the color industry, and especially in the manufacture of nitro-glycerine.

GLYCINE (also called Glycocoll) first obtained by Braconnot (1820) by boiling glue with sulphuric acid; hence called glycocoll from two Greek words signifying sweet and glue; also called gelatin sugar. It is an amino-modification of acetic acid; formula—CH_2NH_2COOH. It is found in animal secretions, but generally in combination; thus hippuric acid, found in the urine of horses and of other herbivora, is a synthetic product of glycine and benzoic acid, benzoyl-glycine, $C_6H_5CO\ N\ H\ CH_2\ COOH$. By boiling this with dilute hydrochloric or sulphuric acid, a hydrolysis is effected, benzoic acid and glycine resulting; this is the best method for obtaining glycine. It may also be conveniently prepared from chlor-acetic acid by the action of ammonia.

Glycine crystallizes from its aqueous solution in colorless transparent rhombic prisms, which melt at 235°c. Being an amino-acid it is able to form salts both with bases and acids; as an illustration of the former we may take the copper compound; of the latter, glycine hydrochloride. With nitrous acid, glycine gives glycollic acid by substitution of the hydroxyl (OH) group in place of the amino (NH_2) group.

Glycine is of special interest as a decomposition product of certain protein substances. Glycocholic acid, a constituent of the bile, on boiling with acids, splits up into cholalic acid and glycine.

GLYCOCHOLIC ACID, n. *glī'kō-kŏl'ĭk* [Gr. *glukus*, sweet; *cholē*, bile]: one of the constituents of bile.

GLYCOGEN, called also animal starch and liver starch. A carbohydrate, closely related to starches and dextrins; formula $(C_6H_{10}O_5)_n$. It is found in largest quantities in the liver of adult mammals; smaller quantities are found in the muscles, and very small amounts are present in nearly all the tissues. It seems to be a regular constituent of all tissues in which rapid cell-formation and cell-development is taking place. It occurs also in the plant kingdom, as in many fungi.

The quantity of glycogen in both liver and muscles depends remarkably upon the food, also upon the state of rest or of activity. After partaking of food, particularly when rich in carbohydrates, its amount is greatly increased; in starvation, the amount is rapidly diminished. During rest, the quantity increases, while during work it diminishes.

Glycogen is an amorphous, white, tasteless, inodorous powder, its solution in water being opalescent, dextro-rotatory, and incapable of reducing cupric salts. Iodine, particularly in presence of sodium chloride, produces a

wine-red color. By diastatic enzymes, glycogen is converted into maltose or dextrose, according to the enzyme used; by dilute mineral acids it is transformed into dextrose. Glycogen is considered important in the development of heat and energy in the animal body; it constitutes an accumulated reserve food in the liver. Whether the liver-glycogen is transformed into sugar or not, seems to be an unsettled question.

GLYCOL (Ethylene Glycol): simplest and first obtained member of an homologous series of compounds called glycols, which are di-hydric alcohols, that is, containing two hydroxyl (OH) groups in the molecule. Glycol was discovered by Wurtz in 1856. It is a thick, colorless liquid, sp. gr. 1.125, of sweetish taste, boiling at 197.5° C. and miscible in all proportions with water and alcohol, but sparingly soluble in ether. Its constitution is thus expressed $CH_2OH–CH_2OH$; and it may be produced from ethylene bromide (a) by boiling with water and lead oxide or potassium carbonate; or (b) by transforming into the di-acetate by means of silver or potassium acetate, and decomposing product by potash or baryta water. This latter method is one by which Wurtz first obtained the compound. It can also be obtained by the oxidation of ethylene $CH_2=CH_2$ by potassium permanganate, and by combination with hydrogen peroxide. The hydrogen of the hydroxyl groups is directly replaceable by potassium or sodium, giving, e. g., mono-sodium glycol $C_2H_4{<}^{OH}_{ONA}$, or di-sodium glycol $C_2H_4{<}^{ONA}_{ONA}$, replaceable also by alkyl radicals, giving ethers, such as ethylene mono-(or di-) ethyl ether; again the replacement may be by an acid radical, as for instance acetyl, when a salt, glycol mon-acetate or di-acetate, would result. The halogen salts are termed chlor-, brom-, iodhydrius, *e.g.*, glycol chlorhydrin $C_2H_4{<}^{OH}_{Cl}$, glycol dichlorhydrin $C_2H_4{<}^{Cl}_{Cl}$.

Glycol when warmed with zinc chloride, gives up the elements of water and is converted into aldehyde, CH_3,-CHO.

GLYCONIAN, a. *glĭ-kō′nĭ-ăn*, or Glycon′ic, a. *-kŏn′ĭk* [Gr. *glukonei′os*, a kind of verse, said to be named from its inventor, *Glykon*]: denoting a kind of verse in Greek or Latin poetry, consisting of three feet, a spondee, a choriamb, and a pyrrhic or iambus.

GLYCOSMIS, *glī-kŏs′mĭs:* genus of plants of nat. ord. *Aurantiaceæ* trees, natives of E. Indies and the Mascarene Islands. The fruit of *G. citrifolia*, an E. Indian species, is delicious.

GLYCOSURIA: the excretion of grape sugar in the urine. This condition is present as one of the symptoms in diabetes mellitus (q.v.), but it is incorrect to employ the term as synonymous with diabetes. Most medical

writers at the present day mean by the term the temporary appearance of sugar in the urine, unaccompanied by the extreme thirst, excretion of large quantities of urine, and other symptoms characteristic of diabetes. Alimentary glycosuria is that form in which sugar in varying amount is found in the urine after the ingestion of a large amount of sugar or starch in the diet. Certain drugs and poisons (opium, chloral, mercurials, arsenic, phosphorus, etc.) may occasionally cause sugar to be excreted, and the condition is sometimes present for a few days in women after childbirth. Occasionally, but by no means always, recurring attacks of glycosuria are followed by the appearance of true diabetes mellitus, but in all cases it is a danger signal, indicating that there is some disturbance of metabolism whereby the normal power of destroying sugar in the body is diminished. Whenever glycosuria is present the amount of sugar and starchy material in the diet should be reduced.

GLYCYRRHIZA, n. *glĭs'ĕr-rī'zăˊ* [Gr. *glukus*, sweet; *rhiza*, a root]: herbaceous plants having the small flowers in bunches or cones, commonly known by the name of *liquorice plants*, ord. *Leguminōsæ*. Glycyrrhizin, n. *glĭs'ĕr-rī'zĭn*, the saccharine matter of liquorice-root.

GLYOXAL: the only known dialdehyde of the fatty series. Discovered in 1856 by Debus. Formula: CHO–CHO. It is the dialdehyde of Ethylene Glycol: CH_2OH–CH_2OH. Formed by careful oxidation of ethylene glycol, ethyl alcohol or acetaldehyde, with nitric acid. Amorphous, non-volatile mass; deliquesces in the air; soluble in alcohol and ether. Alkalies convert it even in the cold, into glycollic acid, CH_2OH–COOH, in which change the one aldehyde group CHO is reduced to the primary alcohol group CH_2OH, while the other is oxidized to the acid group (carboxyl) COOH. Being a dialdehyde, it unites directly with two molecules of primary sodium sulphite, forming the crystalline compound $(CH(OH)SO_3Na)_2+H_2O$; for the same reason, it forms a di-cyanhydrin.

GLYOXALIC ACID (also called Glyoxylic Acid). Formula CHO–COOH or $CH(OH)_2$–COOH—the second form differing from the first by one molecule of water (H_2O), two hydroxyl (OH) groups appearing in the place of one atom of oxygen. Occurs in unripe fruit such as grapes, gooseberries, etc. Is formed along with glyoxal, in oxidation of ethylene glycol, ethyl alcohol or aldehyde by nitric acid. May be prepared by superheating dichloracetic acid, $CHCl_2$-COOH with water, Cl_2 being exchanged for O or 2 (OH). Crystallizes in rhombic prisms, is easily soluble in water, and volatilizes with steam. It is an aldehyde acid, manifesting all the properties of an aldehyde. Like glyoxal, discovered by Debus in 1856.

GLYPH, n. *glĭf* [Gr. *gluphō*, I hollow out, I carve]: in *sculp.*, a notch, channel, or cavity intended as an ornament. Glyphæa, n. *glĭ-fē'ăˊ*, in *geol.*, a genus of small lobster-like

crustaceans. GLYPHOGRAPHY, n. *glĭ-fŏg′ră-fĭ* [Gr. *graphō*, I write]: a particular kind of raised engraved drawing produced by an electrotype process.

GLYPTIC, a. *glĭp′tĭk* [Gr. *gluptĭkŏs*, carving; *gluptos*, carved, sculptured]: of or relating to the art of carving on stone. GLYP′TICS, n. plu. *-tĭks*, the art of engraving figures, as on precious stones. GLYPTOG′RAPHY, n. *-tŏg′ră-fĭ* [Gr. *graphō*, I write]: a treatize on the art of engraving on precious stones. GLYP′TOGRAPH′IC, a. *-tō-grăf′ĭk*, describing the methods of engraving figures on precious stones.

GLYPTODON, n. *glĭp′tō-dŏn* [Gr. *gluptos*, carved, sculptured; *odonta*, a tooth]: gigantic fossil animal belonging, like the Megatherium (q.v.), and the Mylodon (q.v.), to the *Edentata*, but of the family of the *Dasypidæ* or Armadillos. It is found in the post tertiary deposits of the pampas of S. America, and four species have been described. The back and sides of the creature were covered with a carapace of thick polygonal bony plates, which in some cases was nearly six ft. long. The Glyptodon must, from the shape of the carapace, have looked more like a huge tortoise than an armadillo; and in some other respects it resembled the chelonians. Its teeth, eight in each jaw, had each two lateral sculptured grooves, whence its name: see ARMADILLO: ANT-EATER.

GLYPTOTHECA, n. *glĭp′tō-thē′kă* [Gr. *gluptos*, carved; *thēkē*, a repository]: building or apartment for the preservation or exhibition of works of sculpture. The *Glyptothek* in Munich, built 1816–30, has 12 halls, each assigned to an epoch in art. The building contains the famous collection made by King Louis I.

GMEINER, JOHN, American Roman Catholic clergyman: b. Bärnau, Bavaria, 1847, Dec. 5. He studied at St. Francis' Seminary, Milwaukee, Wis., was ordained priest in 1870, was professor in the seminary, and later in St. Thomas' Seminary, St. Paul, Minn. In 1899 he became rector of St. Francis' Church, Buffalo, Minn. In 1893 he addressed the World's Parliament of Religions at Chicago on 'The Primitive and Prospective Religious Unity of Mankind.' His published writings include the volumes; *Modern Scientific Views and Christian Doctrine Compared; Emmanuel: the Saviour of the World; Mediæval and Modern Cosmology.*

GMELIN, *gmā′lĭn*, LEOPOLD: 1788, Aug.—1853, Apr.; b. Göttingen: chemist. His father, Johann Friedrich Gmelin was prof. of nat. history and botany at Tübingen, afterward of chemistry at Göttingen; and for at least four generations members of the Gmelin family have distinguished themselves in chemistry and nat. history. After taking his degree in medicine, he spent several years in study; and was appointed, 1814, extraordinary prof. of chemistry at Heidelberg. In 1850, in consequence of an attack of paralysis, he resigned his professorship, and died three years later, at Heidelberg. He published numerous scientific papers and, 1826, with Tiedemann, the celebrated

work on digestion, *Die Verdauung nach Versuchen*, 2 vols. But his chief service to science, was his chemical dictionary *Handbuch der Chemie*. The first ed. of this great work appeared 1817–19, and included, in two vols. of moderate size, the whole extent of chemical knowledge as it then existed. The fourth and last ed. appeared 1843–55, six vols., the last vol. edited after Gmelin's death. An English translation of this edition, with additions by Mr. Watts, the translator, was published 1861.

GMELINA, *mĕ-lī′na:* genus of trees of nat. ord. *Verbenaceæ*, having a small 4–5-toothed calyx, and a large obliquely bell-shaped corolla. *Gmelina arborea*, called GOOMBAR or KOOMBAR, in India, is the most valuable for its timber, which resembles teak, but is closer in grain, and lighter.

GMELINITE, n. *mĕl′ĭn-īt* [from Prof. Charles *Gmelin* of Tübingen]: colorless, yellowish-white, greenish-white or reddish-white, fresh, transparent to translucent brittle mineral, crystallizing in rhombohedrons. It is found in the Harz, Cyprus, Nova Scotia, and Great Britain.

GMÜND, *gmünt:* town of Würtemberg, in the circle of Jaxt, in a beautiful and highly cultivated district on the Rems, 29 m. e.n.e. from Stuttgart. Gmünd has important manufactures of *bijouterie* and hardware, and carries on spinning and stocking-weaving. Hops are produced in the neighborhood in great quantity. Gmünd was formerly an imperial free city, and in the middle ages had a population of 18,000. It was added to the kingdom of Würtemberg in 1803. Pop. 20,000.

GMÜNDEN, *gmün′dĕn:* town of Upper Austria, at the lower end of the Lake of Traun or Gmünden, in the midst of extremely grand scenery. Salt-mines employ many of the inhabitants. Pop. 7,000.

GNADENHÜTTEN, *gnâ′dĕn-hût-tĕn*, MASSACRE AT: in 1772 the Great Council settled the Christian Indians on the Muskingum River (in Ohio) in three villages, Salem, Schönbrunn, and Gnadenhütten (Tabernacles of Grace), the latter being that of the Delawares. Through the Revolution these Indians as a body took no part in warfare, quietly cultivating their farms. In the fall of 1781 Capt. Matthew Elliott, under orders from the British commandant at Detroit, with a body of white rangers and a miscellaneous horde of Indians from a half-dozen different tribes, forced them to leave their villages, which were half destroyed; the missionaries were taken to Detroit, and the Christian Indians left on the Sandusky plains, where the wild Indians would have massacred them but for the English. A few escaped and returned to the villages; they were captured by the Americans under Williamson, and taken to Fort Pitt, whose commandant, Gibson, their firm friend and attempted protector, sent them back to the villages unharmed. During the winter the rest suffered much from cold and hunger around Sandusky, and

by the spring of 1782 some 150 had returned to the villages. Meantime fiendish Indian outrages were going on; the borderers accused the Moravians of being privy to them, and denounced Gibson and Williamson for letting them go; and after a woman and child had been impaled alive by an Indian gang, who afterward refreshed themselves among the Moravians, the whites formed a party of near a hundred under Williamson to exterminate the latter. In March they gathered those in Salem and Gnadenhütten into two houses at the latter —those at Schönbrunn had been warned and escaped—under promises of good treatment; a council was held, at which 18 protested against the contemplated murder and withdrew, taking an Indian lad with them; the rest went in and killed the 96 inmates, after the latter had prayed and kissed each other farewell, only two other boys escaping. The best men of the borders denounced the cowardly butchery in unsparing language.

GNAPHA'LIUM: see CUDWEED.

GNAR, v. *nâr* [Sw. *gnorla*, to twist, to curl: Dan. *kurre*, a knot or tangle in thread (see GNARL)]: in *OE.*, the same as *gnarl;* to growl; to snarl: N. a hard knot in a tree. GNAR'RING, imp. GNARRED, pp. *nârd:* see GNAUR.

GNARL, v. *nârl* [Dut. *knarren*, to growl, to snarl: Sw. *knarra*, to creak: Dan. *knurre*, to growl: Icel. *gnerr*, a knot, a knob]: to growl; to murmur; to snarl. GNARLING, imp. *năr'lĭng.* GNARLED, pp. *nârld:* ADJ. distorted in large woody knots; knotted; twisted and knotty. GNAR'LY, a. *-lĭ*, knotted or knotty.

GNASH, v. *năsh* [Dan. *gnaske;* Sw. *gnissla*, to crunch, to gnash: Icel. *gnastan*, a gnashing: Dut. *knasschen*, to gnash]: to strike the teeth together as in pain or rage; to grind the teeth; to growl. GNASH'ING, imp.: N. a striking together or grinding of the teeth in rage or pain. GNASHED, pp. *năsht.* GNASH'INGLY, ad. *-lĭ.*

GNAT, n. *năt* [imitative of its humming sound emitted during flight. Sw. *gnadd*, a midge; Norw. *gnette;* Icel. *gnata* to crackle, to rustle]; very small insects belonging to the diptera. The name also applied to the dipterous family *Culicidæ* (see MOSQUITO); also anything proverbially small: TO STRAIN AT A GNAT (*at* for *out*) AND SWALLOW A CAMEL, to guard ostentatiously against a trivial offense while overlooking a very great one.

GNAT: small insects belonging to several groups of *Diptera*, some of which bite very severely, especially the *Simulidæ*. *Simulium columboshensis* is one of the greatest scourges of man and beast in the Bannat of Temeswar in Hungary. The so-called buffalo-gnats and black flies also belong to the *Simulidæ*. They are fully as bloodthirsty as the *Culicidæ* or true mosquitoes. Other families are the Gall-gnats (*Cecidomyiidæ*), the Fungus-gnats (*Mycetophilidæ*) and the midges (*Cheironomidæ*).

GNATHIC, a. *năth'ĭk* [*gnathos*, the cheek or jawbone]: belonging to the cheek or superior maxilla. GNATHITES,

n. plu. *năth′ītz*, in *zool.* the masticatory organs of the Crustacea. GNATHITIS, n. *năth-ī′tĭs*, inflammation of the jaw. GNATHO, *năth′ō*, a prefix in compounds indicating connection with the jaw.

GNAUR, n. *nawr*, or KNAUR, n. *nawr*, and GNAR, or GNARR, n. *nâr*, the last the proper spelling [Dut. *knarren*, to growl: Sw. *knorla*, to twist, to curl: connected with GNARL]: a hard knot in wood.

GNAW, v. *naw* [Icel. *gnaga;* Dan. *gnave;* Ger. *nagen*, to gnaw: comp. Gael. *cnamh*, to wear away; *cnaimh*, a bone]: to eat away or bite off by degrees; to bite in agony or rage; to corrode; to fret. GNAW′ING, imp.: ADJ. eating by slow degrees; corroding. GNAWED, pp. *nawd:* ADJ. bit; corroded. GNAW′ER, n. *-ĕr*, one who or that which.

GNEISS, n. *nīs*: the word is thought to be derived from the Old High German word *Gneista* (Middle High German *Gneists*, Icelandic *gneisti*, Anglo Saxon *Gnast*) 'a spark' (?), but what the connection may be is not clear. Gneiss is 'like granite but with the mica more or less distinctly in layers,' according to Dana. But the characteristic to which it owes its distinction from granite is lamination, and this is largely due to the existence of its mica constituents in parallel planes. But as mica is, according to the modern view, an accessory; and though a frequent, not a necessary, component of granite, it is no longer accurate to speak of gneiss as a laminated granite.

So far as carefully guarded geological speculation can go at present, the oldest rocks known, called on the American continent LAURENTIAN, consist of various gneisses, schists, limestones, and quartzites, which originally were sediments washed away by waves from other still older rocks, of which we can only surmise the character; and deposited in layers by subsidence in lake and ocean. The supervening changes, called metamorphism, have left proofs of the evolution of schists (or rocks with crystallized, foliated components) from slate (smooth surfaced indurated fine mud); of marble (fine calcite crystals united into a compact rock) from limestone (earthy calcium carbonate without crystallization); and of micaceous granite from schist or gneiss.

Consequently in the light they have at present geologists believe the oldest known (Archean) granites to be derived by heat and pressure from the mica-schists and gneisses, just as these latter were similarly produced from finely divided mud, the debris of still earlier rocks. These archean gneisses with their associated rocks, the oldest known on the planet, are not less than 30,000 feet thick, and represent the detrital activity of waves almost exclusively, since very little land was above the level of the Archean sea, and running water could have played only a subordinate part in the abrasion.

The gneisses of this and later ages play an important rôle in the structure of the globe, forming the axes of many of its important mountain chains. Throughout the world they contain the larger number of veins of the precious metals and minerals. They form the bed rock on which

New York, Philadelphia, Baltimore, Washington and many other large cities are built. The best known varieties of gneiss, like those of granite, are the gray and the red, the color depending on whether they contain oligoclase, etc., or orthoclase in greater quantity, and they furnish excellent building stone especially for foundations. Like granite, the soil which is made of their pulverized fragments is rich and fertile, thanks to their alkali-bearing feldspars.

Even more than granite they contribute to the landscape graceful curved lines in their chains of elevations, and wherever, as in the northern middle states and Canada, their crests and slopes have been moulded by glacial action there result the 'rôches moutonnées,' so called because their rounded crests separated by low depressions or gaps, resemble the backs of a herd of sheep. See GRANITE.

GNOME, n. *nōm* [Gr. *gnōmē*, an opinion]: pithy and sententious saying, commonly in verse, embodying some moral sentiment or wise precept. The gnome belongs to the same generic class with the proverb; but it differs from a proverb in lacking that common and popular acceptance which stamps the proverb as with public authority. The use of gnomes prevailed among all the early nations, especially the Orientals; and the literatures, both sacred and profane, of most countries abound with them. In the Bible, the book of Proverbs, part of the book of Ecclesiastes, and still more the apocryphal book of Ecclesiasticus, present, so far as regards language and structure, numberless illustrations of the highest form of this composition. The other books of the Old Testament contain many specimens; and in the New Testament the familiar lessons of the Lord Jesus are frequently presented in this striking form, which was peculiarly adapted to impress and move the classes whom he addressed. The Indian, the Arabian, and the Persian literaures also are rich in gnomes, as are those of the northern nations. But the most interesting form which they have taken is in Greek literature, in which the writers who have cultivated this form of composition are known as a distinct class—the Gnomic Poets (*gnomikoi*). The Greek gnome is commonly couched in elegiac distich; and the most celebrated gnomic poets were Solon, Theognis, Phocylides, Simonides, Tyrtæus, and Xenophanes of Colophon. The most remarkable of these is Theognis, whose gnomes extend to above 1,200 lines. The remains of gnomic writers have been repeatedly edited under the title of *Gnomici Poetæ Græci*, since the days of Melancthon. The standard editions are those of Bekker (1815) and Welcker (1826). There is, moreover, a popular edition by Brunck, reprinted in the Tauchnitz Classics; and the gnomic poets are commonly included in the collections of minor Greek poets.—In Latin literature, the *Disticha* of Dionysius Cato, the authorship of which has proved so fertile a source of controversy, belongs to the class of gnomes. GNO'MIC, a. *-mĭk*, having the character of a gnome; sententious; also GNO'MICAL, a. *-mĭ-kăl*. GNOMOLOGY, n. *nō-mŏl'o-jĭ:* [Gr. *gnomē*, a maxim; *logos*, a word,

a discourse; *legō*, I collect, I speak]: treatise or collection of maxims or sententious reflections or sayings; the knowledge of or literature relating to such maxims or sayings.

GNOME, n. *nōm* [Gr. *gnōmōn*, one that knows; F. *gnome*]: in the cabalistic and mediæval mythology, one of the classes of imaginary beings, said to inhabit the inner parts of the earth, and to be the guardian of mines, quarries, etc. They were supposed to be the presiding spirits in the mysterious operations of nature in the mineral and vegetable world. They have their dwelling within the earth, where they preside specially over its treasures, and are of both sexes male and female. The former are often represented in the form of misshapen dwarfs, of whom the well-known 'Rübezahl,' or 'Number-nip,' of German legend is a fair example. Pope, in the *Rape of the Lock*, and Darwin, in the *Loves of the Plants*, have drawn upon the more pleasing associations of this curious branch of mythology. See ELEMENTAL SPIRITS.

GNOMON, n. *nō'mŏn* [L. and Gr. *gnōmōn*, one that knows, the index of a dial]: in a *sun-dial*, the pin which by its shadow shows the hour of the day; in *geometry*, that which remains of a parallelogram after taking away one of the two parallelograms formed about the diagonal; the sum of any three of the four parts into which a rectangle is divided by cross lines parallel to its sides: see Euclid, ii. prop. 5, et seq.; GNOMON'IC, n. *-ĭk*, or GNOMON'ICAL, a. *-ĭkăl*, pertaining to dials or dialling. GNOMON'ICALLY, ad. *-lĭ*. GNOMON'ICS, n. plu. *-ĭks*, the principles or art of dialling (see DIAL). GNOMONIC PROJECTION: see PROJECTIONS.

GNOSIOLOGY, n. *nŏs-ĭ-ŏl'ō-gy*, [Gr. *gnosis*, knowledge and *logos*, discourse]: the science of knowledge. The term is not in common use. Epistemology (q.v.) is more frequently employed to indicate this science. Certain writers have tried to use the two terms for different phases of the general problem of knowledge, but thus far their recommendations have not been widely accepted.

GNOSTICISM, GNOSTICS. In the early centuries, Christianity, originating, as it did, among the lowly, was a religion, with its articles of belief as yet unformulated into a definite system of doctrine. While it remained the faith of only the humbler and less learned elements in society this was all very well, but when the more educated became its adherents, they desired a more scientific statement of its beliefs; and of course, the chief science of the day was Greek philosophy. The first attempts to state the principles of the Christian religion systematically were accordingly made by a number of philosophers, who, because they thought that they had studied out, and so come to know the truth, styled themselves 'Gnostics,' (*i.e.* 'those who know.') These first attempts were for the most part very crude and fantastic, either because those who made them did not perfectly apprehend the true

nature of Christianity, or of philosophy, or both. Consequently, when later, Christian theology had taken definite form, these earlier attempts were quite rightly repudiated, though those who held them were perhaps too bitterly denounced as heretical.

Gnosticism is really only a general name for a great number of diverging schools, though all of them had some fundamental points in common. It is difficult to state these in detail with certainty, as our chief sources of information in regard to the Gnostics are from their very bitter Jewish and more orthodox Christian adversaries; but the following account may be regarded as substantially correct.

There is a Divine Being, whose essence is love, grace, and mercy. He is enthroned in the highest height, enclosed in an abyss (*Buthos*). He is the sum of being. He is silence, abstraction, incomprehensible, for human minds almost non-existing (*Ouk On*). The Mosaic Cosmogony has not seemingly, they said, brought us one step nearer to the solution of the problem of the creation. Out of nothing, nothing can come notwithstanding a Divine Fiat; for God can, through his spiritual nature, have no connection whatever with corporeal things, and he could not have originally *made* them. Gnostics, therefore, assumed a pre-existing *matter* (*Hyle*), out of which the universe was merely *formed*. A corroboration for this opinion was found—according to the peculiar Gnostic mode of interpretation—in the two adjectives *Tohu vabohu* (without form and void) (Gen. i. 2), applied to the earth, and which were by them interpreted as substantives (Kenoma, Kenon) intended to express the original substance of the universe (Cf. Gen. Rab. i.). Between this Hyle, or visible world, however—which was either represented as the darkness or shadow over against the divine light, as a sluggish, stagnant mass, or as a turbulent, active kingdom of evil—and that supreme, incomprehensible Being, whose goodness could have nothing to do with the evils of the world, no more than his perfection with its defects and misery, there existed a *Plerōma*, or fulness of Light. In this fulness dwelt embodied attributes of Divinity, the abstract ideas of Wisdom, Justice, Right, Power, Truth, Peace, and many more which had emanated or flowed out (in pairs, as some held, male and female) from the supreme central point, as rays innumerable flow out of the sun, as countless numbers from one unit, as echoes from a sound, or as, primarily, all the founts and rivers arise from the waters below. At the head of these emanations or Æons (Everlasting ones—like their source) which, descending lower and lower, form a link between heaven and earth, stands the Nous; and one of the lowest Æons is the *Demiurgos*. He is the real framer and master of the visible world, and partakes to a certain degree of its nature. On the nature of this Demiurgos (Jaldabaoth, Archon), however, the two principal divisions of Gnosticism, which might be termed Judæo-Alexandrine

and Syrian respectively, widely differed. The former took him as the representative and organ of the highest God. It was he who had been put by the divine will over Israel, especially under the name of Jehovah. As other, though inferior, angels presided over the destinies of other nations, so this higher Æon had to protect the peculiar people of God. It was he, therefore, who revealed himself—he who gave the laws—he who sent the prophets. But in all this he acted rather as an unconscious medium; he was no more able to comprehend the full meaning of the ideas revealed through him in the Old Testament, than he understood the scope and significance of the creation. His principal attributes are justice and severity, which, carried out with stern consistency, become cruelty. These Gnostics distinguished, also among the Jews themselves, those 'after the flesh' who, confounding the likeness with the original, the symbol with the idea, took the Demiurgos to be the supreme God, and those 'after the Spirit,' or Israelites indeed—the privileged few who, divining at least the veiled ideas of the supreme God, needed no such education by fear or hope, punishment or reward, at the hands of the Demiurgos, but rose above him in understanding and conception of things human and divine. The other principal party of the Gnostics, however, the Syrian, under the influence of the Parsic (Zoroastrian) Dualism, so far from considering the Demiurgos as an instrument of divinity, willing, but poor in intellect, looked upon him rather as a rival and consequently conflicting power. He is the primary evil opposed to the primary good. The divine germs which, according to parties, had been communicated through the lowest emanations in their downward course to matter and to mankind, the Demiurgos of the Alexandrians had not known how to develop in a proper manner, but had weakened, sometimes neutralized, them from want of knowledge, thus engendering all earthly sin and misery *against* his will, while the Syrian Demiurge spitefully and maliciously stifled these germs in order to wrest the power over the world from the Divine Being altogether. His base, revengeful, and withal limited nature, they said, is fully and clearly stamped upon the Old Testament—exclusively his work.

Man—in this all the schools were agreed—was divided into three classes, corresponding more or less to these predominant powers of the world: Divinity, Matter, and Demiurgos. There were first the spiritual men or *Pneumatikoi*, inspired by the highest God, striving toward him, with him; initiated into his counsels, understanding his essence. They were free from the yoke of law, for terrestrial nature had no power over them; they were the prophets, guiding, but not guided; the possessors of the true Gnosis. Diametrically opposed to these, as was Hyle to divinity, are the terrestrial men, *Sarkikoi* or *Choiks*—of the earth earthy—who are tied and bound by matter; they can neither aspire to the height of spiritual men, nor

are they to be ruled by the precepts of law. Between these stand the *Psychikoi*, the blind servants of the lawgiving Demiurgos, who are, through the restraints put upon them by his either stupid or spiteful precepts, free to a certain degree from the terrestrial powers, but they can never reach the height in which the pneumatics habitually dwell. And again, corresponding to these three classes of men, there were three principal religions—Christianity above, Heathenism below, and Judaism in the intermediate space.

The two leading tendencies of Gnosticism, of which we have spoken, also manifested themselves accordingly, in the view that they each took of the person of Christ himself. According to both, he was the highest Æon, suddenly sent down by the Supreme Being, to rescue and reclaim certain higher natures—for the lowest stratum of men, the carnal or terrestrial, was irredeemably lost—which had either been led astray by the Demiurgos, or had become entangled in the net of matter. The Visible and the Invisible, the Finite and the Infinite, God and Man, cannot combine: in this they all agreed. But while the Judaizing schools divided Christ into two distinct persons, one of heaven and one of earth, who had only become one at the baptism in the Jordan, and who had separated at the crucifixion, the other oriental section of Gnostics held that Christ's earthly manifestation in the flesh, that his whole humanity, was a mere shadow or delusion.

It may be wondered how the Gnostics could profess to show that this extraordinary fusion of Greek and Alexandrian Platonism, Jewish theology, and Oriental mysticism was in any sense an interpretation of the Christian Scriptures. But it must be remembered that the New Testament canon had not yet become definitely established; and Jewish theologians had already set them an example by interpreting the Old Testament in a highly fanciful and allegorical manner. Some of them assumed that Christ and his apostles had still been partly under the influence of the Demiurgos, and also that what they had taught, they had expressed in a literal simplicity suited to the naïve and limited intelligence of their hearers. The Gnostics excluded from the canon those of the earlier books of the present New Testament which seem most out of agreement with their teachings, and introduced a number of epistles and other religious documents of their own, in Greek and Syriac, such as the *Prophecies of Cain, Writings of Pachur, Psalms* by Valentinus and Bardesanes, *Gnostic Hymns* by Marcos, *Books of Adam, Enoch, Moses, Elijah, Isaiah*, etc., not to mention a host of writings by newly invented prophets of such peculiar names as Pachor, Barkor, Armagil, Barbelon, Balsamum, Lensiboras, etc. (Hier. ad Theod. iii. 6, etc.)

Practically, Gnosticism, influenced the lives of its adherents in two totally distinct ways: according to the view they took of the nature and office of the Hyle and Demiurgos. The Hellenizing Gnostics, striving

(Berl. 1818); Möhler, *Urspr. d. Gn.* (Tübingen 1831); Matter, *Hist. Crit. du G.* (Par. 1843–4, 2d edit. 3 vols); Baur, *Die Chr. G.*, (Tübingen 1835). See also Neander's and Gieseler's *Histories of the Church;* Dorner's *Christology;* Bunsen's *Hippolytus and his Age*, and Grätz, *Gnosticismus und Judenthum*, besides many of the histories of Philosophy and of Christian dogma.

GNU, n. *nū* [Hottentot, *gnu* or *nju*], (*Catoblepas*): genus of ruminant quadrupeds, which naturalists generally rank with the antelope family (*Antilopidæ*), but which some place in the ox family (*Bovidæ*), and of which the best-known species has been often described as apparently made up of parts of different animals, not only of the antelope and the ox or buffalo, but even of the horse. This species (*C. Gnu* or *Antilope Gnu*) is a native of s. Africa; it has disappeared from the more settled parts of Cape Colony, but is seen in herds on the arid plains beyond these boundaries in company with the zebra or the quagga, and with flocks of ostriches. The form and action of gnus so much resemble those of zebras and quaggas, that at a distance they may be readily mistaken for them. The size of the gnu is that of a large ass; the general color is yellowish tawny. Both sexes have horns. The limbs are slender, like those of deer and antelopes. The gnu gallops with great speed. It has been usually represented as a very fierce animal, and certainly shows much ability to defend itself with its horns, when unable to escape from danger by flight; but when taken young, it is easily tamed, and readily associates with oxen, accompanying them to and from the field. There are two or three species, all s. African, nearly resembling the common gnu, and one of them at least is considerably larger. Their flesh is said to be palatable.

GO, v. *gō* [AS. *gangan;* Ger. *gehen;* Dut. *gaen*, to go: Icel. *ganga*, to go on foot]: to move from one place to another; to pass; to proceed; to depart; to walk; to be pregnant; to run; to take a direction; to move or work, as a watch or a mill; to contribute, as, the different ingredients which *go* to make up the compound; to conduce; to fall out or terminate; to reach or be extended; to fare. WENT, pt. *wĕnt*, did proceed or go, etc. GO′ING, imp. about to do, as I was *going* to say, etc.: ADJ. moving; travelling; walking; rolling; sailing. GOINGS, n. plu. movements. GONE, pp. *gŏn*, declined; departed; ruined; undone; past; deceased. TO GO AGAINST HIM, to be unfavorable; to lose his case. TO GO AGAINST A TOWN, to besiege or attack it with troops. TO GO ABOUT, to attempt; to engage in. TO GO ABOUT YOUR BUSINESS, to depart and mind your own affairs. TO GO BETWEEN, to interpose; to mediate. TO GO BEYOND, to overreach. A GO-BETWEEN, an intermediate agent; in *China*, an agent or middle person employed in the transaction of important business. A GO-DOWN, in *China*, a one-storied building where goods are kept. THE GO-BY, an evasion; a shifting off; giving the cut; escape by artifice. GO TO! an exclamation meaning, 'come, come, say the

WHITE-TAILED GNU, NEW YORK ZOOLOGICAL PARK.

right thing, or take the right course;' move; begin. To GO ABROAD, to go out of the country; to walk outside the house; to be disclosed or published. To GO ASIDE, to retire to a private place; to err. To GO ASTRAY, to wander from the right course. To GO AWAY, to depart. To GO DOWN, to come to nothing; to disappear; to be swallowed or accepted. To GO FOR NOTHING, to have no meaning or effect. To GO FORTH, to issue; to become public. To GO HARD WITH, to have small chance of escape; to cause serious trouble or danger to. To GO IN, to enter. To GO IN AND OUT, to go freely; to be at liberty. To GO OFF, to depart to a distance; to die; to explode; to run away. To GO ON, to proceed; to make an appearance, as on the stage. To GO OUT, to issue forth; to go upon any expedition; to be extinguished. To GO OVER, to change sides; to read; to examine. To GO SHARES, to divide. To GO THROUGH, to suffer; to undergo; to perform thoroughly. To GO UNDER, to be known by as, to *go under* a certain name; to be ruined. To GO ILL WITH, not to prosper. To GO WELL WITH, to prosper. To GO IN UNTO, in *Scrip.*, to have sexual intercourse with. To LET GO, to allow to depart; to release. GO-CART, a framework moving on wheels for training children to walk. GET ALONG WITH YOU, a familiar expression of disbelief in the words of the speaker, 'talk not so, for I don't believe it.' LITTLE GO, the first examination of an undergraduate in an English university. GREAT GO, the last examination before taking a degree.

GOA, *gō'â:* city, Portuguese settlement of Hindustan, on the Malabar coast, lat. 15° 30′ n. and long. 74° e. Goa was formerly cap. of the Portuguese dominions in India, but is now in hopeless decay. It was valuable chiefly for its harbor, one of the best on the w. coast of Hindustan, from which it was about 5 m. distant; but having the misfortune to be ravaged by the cholera in the beginning of the 18th c., most of the Portuguese left it, and settled nearer the sea, at Panjim or New Goa, which is the present seat of govt., with pop. about 14,000. The inhabitants of the old city are almost entirely ecclesiastics, the place being the see of a Rom. Cath. abp., primate of the Portuguese Indies. Goa was conquered by Albuquerque 1503, at which time it was inhabited by an Arabic people.

The dependent *territory* of GOA stretches in n. lat. from 14° 53′ to 15° 48′, and in e. long. from 73° 43′ to 74° 24′; 1,062 sq. m. Pop. about 600,000.

GOAD, n. *gōd* [Norw. *gadd,* a sharp point: prov. Dan. *gadd,* a prickle: Icel. *gadda,* to goad: *gaddr,* a goad: Gael. *gad,* a strong stick]: a pointed stick used in driving oxen. V. to drive as with a goad; to urge forward; to rouse by anything severe or irritating; to stimulate. GOAD'ING, imp. GOAD'ED, pp. GOADS'MAN, n. a driver with a goad.

GOAF, n. *gōf,* or GOB, n. *gŏb* (see GOBBING): in *mining,* the waste or empty space left by the extraction of a seam of coal.

GOAL, n. *gōl* [Gael. *geal,* anything white, a mark to

shoot at; *gobhal*, a post, a pillar: F. *gal*, the goal at football; *gaule*, a long pole set up to mark the bounds of the race]: the winning-post at football or on a race-course; final purpose or aim.

GOA POWDER, *gō'â:* drug obtained from the trunk of a tree first found in the Portuguese colony of Goa, since cultivated in Portugal and its African and Asiatic colonies. It is prepared in the form of a yellowish-brown powder which grows darker on exposure to the air, and when made into a paste or mixed with vinegar or lime-juice is used locally for the cure of ringworm and various other skin diseases. When given internally it acts as an emetic and purgative. The powder when used by itself leaves a stain difficult to efface, and is very irritating to the eyes; hence it is found best to apply it in the form of ointment.

GOAR, or GORE, n. *gōr* (see GORE 3): a triangular piece put into the skirt of a garment in order to widen a part; a *gusset* is a triangular piece inserted into the body of a garment to widen and strengthen a part, particularly in the armpit and shoulder, to permit the arm to have unrestrained movements.

GOAT, n. *gōt* [AS. *gat;* Dan. *ged*, a goat: Icel. *geit*, a female goat]: a well-known animal used for its milk and flesh. GOAT'ISH, a. resembling a goat; of a rank smell; lascivious. GOAT'ISHNESS, n. GOATCHAFER, n. a kind of beetle. GOATHERD, n. one whose occupation is to tend goats.

GOAT (*Capra*): genus of mammiferous quadrupeds, ruminant, with cloven feet, and hollow horns which turn upward and backward. The goat has 12 molars and no incisors on the upper jaw, while the lower jaw has 12 molars and 8 incisors. The male has a long beard under the chin. The real goat is not found wild in this country, but has been domesticated in almost all parts of the habitable world. The wild goat (*C. ægagrus*) is found in large herds throughout the mountainous regions of central Asia and is regarded by many naturalists as the parent race of the various domestic varieties, though others claim that the parent stock is now extinct. The ibex (*C. ibex*) is an agile species with large, square horns, which frequents high mountain ranges in Europe and Asia.

In many respects the goat has close resemblance to the sheep, while in other directions it approaches the antelope. The horns are longer than those of the sheep and turn upward and backward instead of downward and spirally as in sheep. The goat has a shorter tail and the face is more nearly straight than that of the sheep, while the beard, a prominent characteristic of the goat, is wanting in the sheep. The male goat also has a strong odor which is not emitted by the sheep. The goat is stronger, more agile and hardy than the sheep, and when tamed is much less timid. In its wild state it frequents rocky places, is very wary and difficult of approach by man, leaping from ledges and cliffs, and seldom losing its footing. It feeds on the leaves and

twigs of shrubs and herbs as well as on grass. It was regarded as an enemy by the vine by the ancient Romans, who, on this account, sacrificed it to Bacchus. In the Old Testament the goat is often mentioned as an emblem of strength and also of licentiousness.

The Angora Goat, native to Asia Minor, is remarkable for its long, soft and lustrous hair from which the celebrated mohair goods are manufactured (see ANGORA). The Cashmere Goat, of n. India and Tibet, yields the material of which the famous Cashmere shawls are made (see CASHMERE).

The common goat (*C. hircus*) has been domesticated from the earliest ages. The patriarchs kept large flocks of goats; they were offered as sacrifices for sin under the Mosaic dispensation; they are figured in Assyrian inscriptions, and were generally distributed throughout the ancient world. In modern times the goat, though kept in nearly all countries, has never been as popular as its rival the sheep, which is far more profitable in localities to which it is adapted. The goat will thrive in rocky situations and in scanty pastures where sheep will not thrive. In the cultivated lands of Great Britain the number of goats has gradually declined, but in the mountainous districts of Scotland and Wales are many large herds in a semi-wild state. In the United States the goat is seldom kept in large numbers. Its habit of breaking through or leaping fences and roaming at will is a great objection, as is also its tendency to browse on young trees. Where the pastures are good, sheep are to be preferred. The goat is capable of enduring confinement and is kept to quite an extent in cities and towns. In former times the skins of goats were largely used for clothing. At present some of the finest morocco leather is derived from this source, and from the skins of the young the genuine kid gloves are made. The flesh of the goat is not highly esteemed, though it has been used for food from early times. The ancient Irsaelites used both the flesh and the milk, but were not allowed to eat the fat. The flesh of the kid is said to be delicate and nutritious, but that of the mature goat is somewhat indigestible. The milk of the goat is considered more nutritive and healthful than that of the cow. The quantity yielded by an ordinary goat is small, but where special care has been taken in breeding to develop the milking qualities there has been marked increase. From two to three quarts per day for several successive months is sometimes given. Owing to its habit of eating briers and bushes the goat has sometimes been found useful in destroying such growths in neglected pastures though its dislike of confinement makes it difficult to fence sufficiently to keep it from trespassing. The goat is sometimes employed also to protect sheep from dogs and wolves. Two or three goats will defend 50 to 100 sheep.

The goat reaches maturity very early, and is quite prolific. It breeds once, and in many cases twice, a year, producing from one to three at a birth. Early and fre-

quent breeding is injurious, reducing the size and vigor of the animals and impairing the milking qualities. It should not be kept after reaching seven years of age. It is subject to few diseases. The goat can be kept in winter on rather coarse hay, straw, and roots. In s. Europe the goat is largely used for drawing light loads, and in this country it is often seen in public parks harnessed to small carriages in which children ride.

GOAT, Rocky Mountain (*Aplocerus montanus*): ruminant mammal with hollow and permanent horns; resembling both the goat and the deer, but belonging to the antelope family. It is found on the Rocky Mountains. It is about the size of a sheep, and has a large quantity of long, straight hair, resembling wool, which would be valuable for manufacturing purposes if a supply could be obtained. It is sometimes called the Sheep-antelope. The flesh is of little value. Domestication has been proposed, but, on account of the natural disposition of the animal, would be extremely difficult, and is not known to have been successfully attempted.

GOAT ISL'AND: islet of abt. 70 acres, on the very brink of Niagara Falls. It is connected with the United States shore by a bridge 900 ft. long; and is about 2,000 ft. from the Canadian shore.

GOAT'-MOTH (*Cossus ligniperda*): lepidopterous insect of the same family with the Ghost-moth, *Hepialidæ*. The genus *Cossus* has long antennæ, a large body, a very small

Caterpillar, Chrysalis, and Imago of the Goat-Moth (*Cossus ligniperda*).

head; the upper wings larger and longer than the lower. The larvæ feed on the wood of trees, and the pupæ are inclosed in cocoons, made chiefly of the sawdust which the

mandibles of the larvæ have produced. The goat-moth is a large moth, measuring 3 to 3½ inches from tip to top of expanded wings. It is of gray color, the upper wings mottled with white, and marked with many irregular black lines, the lower wings of almost uniform brownish ash-color. The larva is about 3 inches long when full grown, yellowish, the upper parts pink, the head black. The larva inhabits and feeds on the wood of willows, poplars, and elms, making holes large enough to admit the finger, and often causing the destruction of trees. It emits, when alarmed or handled, a peculiar and disagreeable goat-like odor, which cannot be removed from the hands even by frequent washings. The larva takes three years to come to maturity.

GOAT'S'-BEARD. See SALSIFY.

GOAT'S' RUE (*Galega*): genus of plants of nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*, of which one species (*G. officinalis*), a perennial herbaceous plant, about three ft. in height, with pinnate leaves, long pointed leaflets, racemes of generally purplish or pink colored flowers, and upright, nearly cylindrical pods, has been recommended for cultivation as a forage plant, for its great bulk of produce: it has, however, a peculiar smell, and is not relished by cattle unaccustomed to it. It is a native of s. Europe.

GOAT'SUCKER (*Caprimulgus*): genus of birds of the family *Caprimulgidæ* (q.v.), having the upper mandible curved at the point, and furnished along each margin with a row of strong hairs or bristles (*vibrissæ*) directed forward; the hind toe capable of being directed forward; the claws short, except that of the middle toe, which is remarkably long, and serrated on its inner edge, so as to form a kind of comb attached to the toe. Although the bill is very short and weak, the gape is extremely wide, as if the head itself were divided. The goatsuckers feed on insects, perhaps chiefly on moths, whence they are called *Moth-hunters*, and pursue their prey either in the evening twilight or during the night in a manner similar to bats and swallows. Like them, they seem to confine themselves to a limited space, in which they often pass and repass at no great height above the ground. They have great rapidity and power of flight. Their great width of gape is favorable for capture of insects. Goatsuckers are birds of light, soft plumage, in general minutely mottled with gray and brown. The COMMON GOATSUCKER or EUROPEAN GOATSUCKER (*C. Europeaus*), is called also the Night-Churr, or NIGHT-JAR, from the sound which it produces; and frequently, from the resemblance of its plumage to that of owls, the CHURN OWL or FERN OWL. Its migrations extend from Britain n. to Scandinavia, Siberia, and Kamtchatka. In winter, it retires from Europe altogether, passing to the south of the Mediterranean. It often haunts bushy places and grounds covered with brake. It scarcely makes a nest, but deposits two eggs in a depression of the ground, under shelter of a bush. Its whole

length is about ten inches and a half. This bird is the *Caprimulgus* of Pliny, the *Aigothelas* of Aristotle, both these names being exactly equivalent to the English goat-sucker, and expressive of the ancient popular notion, that this bird sucks the teats of goats, a notion probably founded on the habit—observed in some of this family—of hunting insects under the bellies of grazing cattle. In perching, the goatsucker sits *lengthwise* on the branch. Species are widely distributed over the world. An American genus nearly allied, is *Chordiles* (see NIGHT-HAWK); also a group *Antrostonus* (see CHUCK-WILL'S WIDOW: WHIP-POOR-WILL).

GOB, n. *gŏb* [F. *gober*, to swallow greedily; *gobet*, a mouthful: Gael. *gob*, the mouth: It. *gobbo*, a hump or hunch]: a hump. GOBBET, n. *gŏb′bĕt*, a mouthful; a morsel: V. to swallow as a mouthful. GOB′BETING, imp. GOBBETED, pp. *gŏb′bĕt-ĕd*.

GO-BANG, n. *gō-băng′*: a game of Japanese origin played with thin counters of bone or ivory on a board marked with 324 small squares.

GOBAT, *go-bâ′*, SAMUEL, D.D.: 1799, Jan. 26—1879, May 12; b. Cremine, Berne, Switzerland: Anglican bp. of Jerusalem. Little is known of his early history, except that he was a presbyter of the Lutheran Church in Prussia, under which he served as a missionary in Abyssinia, 1830–2. Subsequently, he was vice-principal of the Malta Protestant College; and 1846 was consecrated first Anglo-Prussian bp. of Jerusalem on the nomination of the king of Prussia. The creation of this see caused much controversy and difficulty at the time the Oxford 'Tractarian' movement was at its height. His *Journal of a Sojourn in Abyssinia* (1834) was for a long time the most authentic account of that country.

GOBBE, *gŏb*, or VOANDZOU (*Voandzeia subterranea*): annual plant, allied to the kidney-bean, but of which the pod is thrust into the ground in the same manner as that of the ground-nut (*Arachis hypogæa*, see ARACHIS), to ripen the seeds there. It is a native of the s.e. of S. America, and of some parts of w. Africa. Its seeds are used as food, being wholesome and agreeable when boiled.

GOBBING, n. *gŏb′bĭng*, or GOBBIN, n. *gŏb′bĭn*, and GOFFIN, n. *gŏf′fĭn* [W. *gob*, a heap, a mound: F. *gobbe*, a poisoned morsel (see GOB)]: the refuse thrown back into the mine, after the removal of the coal, to help to support the roof.

GOBBLE, v. *gŏb′bl* [a word imitative of the sound: Dut. *gobelen;* Icel. *gubba*, to vomit: F. *gober*, to swallow; Gael. *gob*, the mouth]: to swallow in large pieces; to swallow greedily and with noise; to make a noise like a turkey-cock. GOB′BLING, imp. *-blĭng*. GOBBLED, p.p *gŏb′bld*. GOB′BLER, n. *-blėr*, one who swallows in haste; a greedy eater; a turkey-cock—so called from the character of the noise it makes.

GOB'BO, or Gob'bio, or Gom'bo: see Hibiscus.

GOBELINS, n. plu. *gŏb'lĭnz* [named from *Gobelin*, Fr. dyer in the reign of Francis I.]: the royal manufactory of tapestry near Paris; the fabrics there made: see Tapestry.

GOBEMOUCHE, n. *gōb-môsh* [F. a fly-swallower]: silly, simple, credulous person, who will believe anything; usually listening open-mouthed to any extravagant story.

GOBI, *gō'bē*, or Shamo: vast desert in eastern central Asia. Gobi is the Chinese, Shamo the Mongol name for the wide region of steppe and desert which extends from the Thian-Shan Mountains to the Kuen-Lun and Nan-Shan Mountains, bordering on e. Turkestan to the west, and occupying great part of the area 40°—45° n. lat., and 90°—118° e. long. The 'desert' is not sterile throughout. On the n. and on the s. is a wide belt of firm steppe, consisting mostly of vast green levels covered with abundance of pasture, but broken by numerous ridges of hills. Between these two belts, each at a height of 4,500 to 5,500 ft. above the sea, lies a depressed tract, not more than 2,500 to 3,000 ft. above sea-level, varying in breadth from 230 to 460 m. This alone—especially its eastern part—is properly called Gobi, or 'sea of sand;' it is an utter wilderness of sand and stones, and is probalby the bed of an ancient sea. The salt sand of which its soil is mainly composed produces nothing but a few scrubby plants. The fauna of the Gobi, even in the wider sense, is limited, including little save hamsters, dziggetais, a few wild sheep and antelopes. There are no fixed habitations even in the steppe country; the inhabitants, chiefly Mongols, all are nomads. Yet in various places there are traces of ancient cities buried in the shifting sand. They have not been explored. The winter here is intensely cold and stormy, and the summer excessively hot. Yet the wandering hordes of Mongols have no difficulty in keeping large herds, which find plenty of rich pasturage on the steppes, and even in winter contrive to pick sufficient food from beneath the snow. From want of wood the nomadic tribes have to use dried dung as fuel. Little is known of the Gobi, save in the neighborhood of the main tracks across it, of which the chief is from Maimatchin to Pekin.

GOBLET, n. *gŏb'lĕt* [F. *gobelet*, a wide mouthed vessel to drink from—from mid. L. *cupellum*, a goblet: F. *gobelotter*, to guzzle, to tipple: Gael. *gob*, the beak, the mouth (see Goblin)]: a cup or drinking-vessel without a handle; a bowl.

GOBLET, *go-blā'* René: French statesman: b. Aire-sur-la-Lys, 1828, Nov. 26; d. Paris 1905, Sept. 13. He was educated for the law, practiced with notable success in Amiens, was appointed attor.-gen. to the court of appeals by the provisional govt. 1870, elected member of the national assembly 1871, of the chamber of deputies 1876, became under sec. of state for justice and mayor of Amiens 1879, minister of the interior 1882, education and public worship 1885,6, pres. of the council and minister of the

interior 1886, and minister of foreign affairs 1888. He founded 1869 *Le Progrès de la Somme* a liberal journal, interdicted the production of Zola's *Germinal* 1885, and was considered an accomplished orator.

GOBLIN, n. *gŏblĭn* [OF. *gobelin,* hobgoblin: Ger. *kobold,* the goblin or spirit of the mines: W. *coblyn,* a knocker, a goblin]: familiar demon of popular superstition—known also as *Bogle* or *Bogie;* supposed supernatural being of small size but of great strength, lurking about houses, or dwelling underground in mines, in mounds, and in desert places, not necessarily ill-disposed toward men: an evil spirit: a fairy. HOBGOBLIN, a spirit.—Some have derived the word Goblin from Fr. *gober,* to swallow, to devour; and others the words elf and goblin from the Guelphs and Ghibellines, each name being used by the other party as a name of terror. Goblin is used in a serious sense by Shakespeare in *Hamlet,* where the ghost is supposed to be either a 'spirit of health or goblin damned.' *Gobelet,* in French, is applied to juggler's tricks and instruments, and the English word goblet is said to come from the juggler's cup.

GOBY, n. *gōbĭ* [F. *gobie;* L. *gōbĭŭs*], (*Gobius*): genus of acanthopterous fishes, type of the family *Gobiidæ.* This family is distinguished by thinness and flexibility of the rays of the dorsal fin; by union—in most of the genera—of the ventral fins, which are thoracic, into a disk more or less capable of being used as a sucker; by lack of an air bladder; and by a long intestinal canal without cœca. The Blenny (q.v.) family (*Bleniidæ*) have by some ichthyologists been united with the Goby family, while others unite with them the *Discoboli* (q.v.). The true gobies (*Gobius*) are generally small, some inhabiting the shallow water of the coasts, others found in deeper water; the species very numerous in the seas both of the n. and s. hemispheres. They are very interesting on account of their habits; and are of the number of nest-building fishes, employing *algæ* and grass-wrack (*Zostera marina*), in the spring season, for making their nests. When the female has deposited her eggs in the nest, the male watches over them till they are hatched. The BLACK GOBY (*G. niger*), is a large British species, about five or six inches long. Some species are often found in rockpools on the coast; many live in such fresh waters as are near the sea.

GOCLENIUS, RUDOLF, (1547–1628) studied philosophy and theology at Marburg and Wittenburg, and became Privat-docent at Wittenburg in 1571. He became rector of the paedogogium at Cassel in 1575, professor of physics at Marburg in 1581, and, in 1589, of logic, ethics, and mathematics. He wrote a series of logical, ethical, and psychological treatises, and a lexicon of philosophy that was useful in its day.

GOD, n. *gŏd* [AS. *God;* Icel. *gud;* Dut. *God;* Ger. *Gott;* Pers. *khoda;* Hind. *khooda;* Lat. *Deus;* G. *Theos*]: the

Supreme Being; the Deity; the Almighty; an idol or worthless object of worship. GOD, v. in *OE.*, to treat as a divinity; to deify. GOD'DING, imp. GOD'DED, pp. GOD'DESS, n. fem. *gŏd'ĕs*, a female heathen deity or idol. GODFATHER, n. one who becomes sponsor for a child at baptism—a woman who does so is called a GODMOTHER. GODCHILD, n. a child for whom one becomes sponsor. GODSON, n. a male child—GODDAUGHTER, n. a female child—for whom one becomes sponsor at baptism. GODHEAD, n. *gŏd'hĕd* [*God*, and AS. *head*, person, quality, state]: the Divine essence or nature; the diety. GODLESS, a. *gŏd'lĕs*, impious; regardless of God. GOD'LESSLY, ad. *-lĭ*. GOD'LESSNESS, n. state of being godless or irreligious. GOD'LIKE, a. *-līk*, resembling God; of superior excellence; divine. GOD'LY, a. *-lĭ*, devout; pious. GOD'LINESS, n. a religious life; piety; the revelation of God in Christ, as, 'great is the mystery of godliness.' GOD'SEND, n. an unexpected acquisition or piece of good fortune. GOD'SHIP, n. rank or character of a God. GOD FORBID, a strong exclamation, indicating the desire that a stronger power than man may intervene. GOD-BOTE, ancient ecclesiastical fine, for crimes and offenses against God. The word bote, same as boot, is the old Saxon *bot* or *bote*, a reparation or satisfaction—e.g., man-bote was the compensation due for the life of a man. GOD-SPEED, God be with you; may God prosper you. GOD'WARD, ad. *-wẽrd*, toward God. AMONG THE GODS, in *familiar language*, the audience in the upper gallery of a theatre—so named in allusion to their elevated position, and the ceiling being generally painted to resemble the sky. GOD'S ACRE, a churchyard or burial ground. OFFENSES AGAINST GOD: see SACRILEGE. *Note*—In written or printed compositions, the word GOD, designating the Supreme Being, begins with a capital letter, thus, *God;* but when an idol or false god is meant the word is wholly in small letters, thus, *god. God* is not derived from *good*, as is often supposed.

GOD: the Self-existent, Supreme, Almighty, All-wise, Infinite, Eternal, Holy, and Blessed Spirit; the Living One, who is the source of all life; the creator, preserver, and ruler of all things; the Father of men. The name is of Saxon origin. The idea is more or less definitely expressed in every language, as it may be said to be in one form or another a universal element of the human consciousness. There have been many nations, indeed, in every age of the world, that have been far from attaining any such conception of God as is expressed above. The Supreme has been to them the conception not of a single Being, but of many beings of greater power than man, and claiming his worship. In the general history of nations after the loss of that original monotheism whose record appears in Genesis, a tangled, shifting, capricious polytheism prevails, from which there is an ascent by slow gradations to the primeval belief in One living God, infinite and self-existent.

The general character of polytheism is everywhere the

same. A dualistic conception of nature and life is traceable as underlying it, and shows itself in varied expressions. In looking forth on nature—in looking within himself—man seems to see two principles striving for the mastery—an active and passive, a creative and recipient principle—a good and evil, a productive and destructive, a joyous and gloomy agent. On one side, there seems a power rich, benignant, and gracious, giving light to the day, verdure to the spring, abundance in autumn, scattering fecundity and blessing around; on the other side, there seems a power cruel and malevolent, quenching the light in darkness, consuming the verdure and fertility with scorching heat, or destroying them with cold. These contrasts seem eternal—they take possession of the imagination, and clothe themselves in diverse shapes. In every polytheistic religion, they will be found in the recognition of male and female, of good and evil divinities—Baal and Baaltis, Baal-Adonis and Baal-Moloch, in the old Phœnician religion; Osiris and Isis and the evil principle, Typhon, in Egypt; and the more familiar opposites of Ahriman and Ormuzd, Jupiter and Juno, etc. The dualism assumes various shapes, now male and female, productive and passive; and now good and evil, conservative and destructive. It is true indeed that this dualism is modified by other elements, such as the conception of fate or destiny, and chance.

Whether this dualistic mode of conception, and the polytheistic view of nature that springs from it, be a later or an earlier type of thought than the monotheistic, has been much disputed. Some see in it the corruption of monotheism—the worship of the Supreme gradually falling to a worship of the great forms of nature which most strikingly represent Him—the sun and storm, the light and darkness, etc. Others, again, regard the polytheistic as the primitive view of nature, above which man gradually rises, by the growth and exercise of his reason, under the inspiration and impulse of God's continual revelations of Himself. As concerns nations originating since man's earliest loss of the idea of one God, there is truth in this latter view, even to those who most firmly hold that man originally received a Divine Revelation, which he has gradually corrupted. Polytheism is the natural religion of savage tribes throughout the world; and correspondent to man's advance in civilization are purer and more comprehensive conceptions of Deity. His reason, set free for its unbiased exercise, tends to recognize the One in the many everywhere, to carry up all his conceptions into a unity. Polytheism, consequently, everywhere disappears with steps equal to those of advancing knowledge, light, reasonableness, and a true manhood. It is incompatible with even the lowest stage of speculative development.

But while the growth of reason and the rise of speculation everywhere destroy polytheism, they do not necessarily in every case substitute a genuine monotheism—the doctrine, that is to say, of one living and true God, infinite and eternal in power, wisdom, goodness, and truth, a free personal Being exalted above the world, and apart from

it, yet intimately related to all its creatures, who 'suffereth not a sparrow to fall to the ground without his permission.' This is the doctrine of Christian theism, as opposed alike to polytheism (doctrine of many gods); and to pantheism (doctrine that all things are God—making God a unity, yet only an abstract unity consisting in the comprehension of an infinite number of particular existences, not a self-subsistent and independent unity), and to atheism (assertion that there is no God).

The course of argument on which the theistic conclusion supports itself may be sketched as follows: There are everywhere in the world the traces of order; a unity of plan or design, shown in innumerable beautiful effects, pervades creation. Science is always unfolding it more and more. Of *the fact* of this order or unity of plan, there is no question. The progress of science, if nothing else, has effectually exploded the old dualistic or polytheistic conception of nature. What appeared to be the result of opposing principles, is really found to be the issue of general laws working on some great though unexplored scheme of harmony. There is no disturbance, no *disorder;* amid the infinite diversity of nature and even through all its visible antagonisms—*order* reigns universally.

But this 'order,' what is it? The mere recognition of order, it is said, does not necessarily imply the recognition of God—of a 'Being all-powerful, wise, and good, by whom everything exists.' The materialist and pantheist also equally admit the fact of order, but equally deny the theistic conclusion founded on it (which, we may suggest, is a belief in *order* while denying any *ordering*), and the argument, accordingly, is carried up from nature and its facts to a higher region of discussion. It might better be said that the argument is carried up, not 'from' nature and its facts, but *to include with* nature and its facts a higher range of discussion. But merely noting this in passing, and continuing the theistic argument as it is now usually presented—whence arises the conception of order—of design? Nature illustrates it, but nature, it is said, does not itself give it. Yet it is undeniable that nature does give it *to the mind of man,* which is the very tribunal before which the question is being presented. The general laws of which science speaks so much pervade all phenomena of creation, but they are not a part of these phenomena: thus it is asserted. But these laws of nature are a part of nature even though not a part of the phenomena. Is nature merely appearance and not reality? 'Order' and law are ideas which *we* indeed attribute to nature as facts, but it is because nature shows us those facts as existing; otherwise our attributing of them would be a fallacy and nothing worth. They come from within, not from without, it is said; but it is plain that they come from both, and must come from both unless they are baseless. We start with both mind and matter. The latter in itself presents a mere series of endless movements: in the presence of mind it necessarily assumes meaning and *order*. Mind is the true image of the Deity. We discern *causation* in nature for

two reasons: first, because causation is there to be discerned; secondly, because we ourselves are *agents*, conscious of exerting power. We discern *order* in nature, because nature is an ordered or arranged whole; also, because we everywhere bring our conceptions into a unity, and apprehend our several modes of consciousness with reference to the indivisible self which they all involve. 'In our life alone does nature live,' is more poetic than scientific. Nature exists, whether we live or die or never are born. But the following may be accepted as beautifully setting forth one great side of the truth, and that the deepest and most impressive: 'It is from the little world of our own consciousness, with its many objects marshalled in their array under the rule of the one conscious mind, that we are led to the thought of the great universe beyond—that we conceive this also as a world of order, and as being such by virtue of its relation to an ordering and presiding mind.'

The existence of Deity, therefore, according to both lines of the argument indicated above, is a postulate of the human consciousness. Recognize in man a living mind independent of matter—a *rational will*, as constituting the essential and distinguishing element of his being—and the inference is inevitable of an infinite mind—a supreme will governing the world. A true natural theology is based on a true psychology. A philosophy which denies to man a higher existence than mere physical nature, which would make his rational consciousness the mere growth of material conditions, leaves no ground of argument for the existence of Deity; since practically it involves an exclusion from the argument of the mind which is to argue, and by which the facts of the whole case are to be discerned. Reducing the human reason to this point, it makes true *to such a mind* the eloquent utterance of Jacobi, though with an application modified from his: 'Nature reveals only fate, only an indissoluble chain of causes (sequences), without beginning and without end, excluding with equal necessity both providence and chance. Working without will, she takes counsel neither of the good nor of the beautiful; creating nothing, she casts up from her dark abyss only eternal transformations of herself, unconsciously and without end. But man *reveals* God—for man, by his intelligence, rises above nature, and in virtue of this intelligence, is conscious of himself, as a power not only independent of, but opposed to, nature, and capable of resisting, conquering, and controlling her. As man has a living faith in this power superior to nature, which dwells in him, so has he belief in God—a feeling, an experience of his existence. As he does not believe in this power, so does he not believe in God; he sees, he experiences naught in existence but nature, and necessity, and fate.'

The argument for the existence of God rests, accordingly, on certain fundamental principles of our mental and moral being, such principles as causation and design, or final cause; and on the observed facts of the physical universe 'the things that are seen.' It implies a spiritual as against a materialistic philosophy of human nature.

Some philosophers have sought not merely to rest the argument for the existence of God upon man's consciousness and experience, but to evolve it in all its completeness from them alone. From a single datum of consciousness—sometimes from a single datum of experience—they have tried to construct, by processes of mere abstract reasoning, a 'demonstration of the being and attributes of God.' This has been styled the *a priori* method of argument, though to all the arguments to which this name has been given the term does not strictly apply. The mode of argument, on the other hand, which reasons only from special effects in nature to a First Cause, has been styled, in contradistinction, *a posteriori*. The argument from design, e.g., as conducted by Paley and others, is *a posteriori*. The arguments of Descartes, and the 'demonstration' of Dr. Samuel Clarke, are what have been termed *a priori*. Either of these modes of proof, taken by itself, has been rightly considered inconclusive, or at least dangerously incomplete, by recent writers on natural theology. Mere *a priori* trains of reasoning fail to carry up the mind to any real and living conception of Deity; they yield merely a theoretical or abstract idea. Arguments such as Paley's and the Bridgewater treatises on the other hand, though of great excellence and strength as illustrations, are illustrations rather than real arguments. They derive all their logical force from certain principles which are implied in their details, principles without which these details fail as convincing evidence of the existence of God. The very idea of Design itself is such a principle. It is in nature indeed; but the mind itself is so constituted that it cannot on any large scope conceive of nature as without design: thus the mind takes design into nature and finding the outward facts fitting to its natural conception, necessarily accepts each as corroborating the other, and by both the outward and the inward witness establishes the truth. Any complete argument for the Being of God, therefore, involves equally *a priori* and *a posteriori* elements. The former are necessary as the rational foundation of the argument; the latter are necessary to illustrate, to give life and body to the general principles which lie at the foundation.

For the Christian doctrine of the Godhead, see TRINITY: SON OF GOD: HOLY SPIRIT. See also ATHEISM: PANTHEISM: MATERIALISM.

GODAVERY, or GODAVARI, *gō-dâv'ĕr-ĭ:* one of the principal rivers of the peninsula of Hindustan, and the largest of the Deccan, rising within 50 m. of the Arabian Sea, and flowing s.e. across the peninsula into the Bay of Bengal. Its source is in the e. face of the Western Ghauts, lat. 9° 58′ n., and long. 73° 30′ e.; and its two mouths, diverging in lat. 16° 57′ n., and long. 81° 49′ e., enter the sea respectively in lat. 16° 48′ and long. 82° 23′, and in lat. 16° 18′ and long. 81° 46′. About 23 m. above the head of the delta, the G. emerges at Polaveram from the Eastern Ghauts, through which it has passed with so moderate a descent as to be navigable in either direction. The s. arm

of the Godavery admits vessels drawing eight or nine ft.; and the n. one has a depth of two or three ft. more. Like tropical streams in general, the river varies greatly, according to the season in breadth and depth. But a dam or annicut (see CAUVERY) has been constructed, to mitigate the evil for purposes of navigation and of irrigation. The length of the Godavery is about 900 m.—For the *district* of Godavery, see RAJAMAHENDRI.

GODESBERG, *gō-dĕs-bĕrch:* village of Rhenish Prussia, with a fine ruin; on a conical hill in a plain on the left bank of the Rhine, four m. s. of Bonn. It has a mineral spring, and is a favorite summer residence. It derives its name, not from Woden, who is said to have been worshipped here, but probably from the Gau-ding, or Goding, the district court which may have held its sittings at this place. The castle was erected by Dietrich, Abp. of Cologne (1208–13), with materials from the ancient chapel of St. Michael, the ruins of which are still standing near the castle. In 1582, Gebhard, the deposed archbishop, took refuge here, and intrusted the castle to a Dutch garrison. It was, however, soon taken by his successor, on which occasion it sustained much injury. During the Thirty Years' War, it was alternately in possession of the Swedes and the Imperialists, and was finally almost demolished by the French. Only one fine tower, 90 ft. in height, is still standing. It commands a magnificent prospect of the Siebengebirge and great part of the valley of the Rhine, and is, on this account, much visited by strangers. Pop. of Godesberg 3,000.

GO'DEY, LOUIS ANTOINE, American publisher: b. New York 1804, June 6; d. Philadelphia 1878, Nov. 29. He founded the periodical, *Godey's Lady's Book,* the first of the kind in the United States, at Philadelphia, in 1830, and continued its editor and proprietor, until its sale to a stock company in 1877. His other publications included *Jarvis' Musical Library,* and the *Daily Chronicle.*

GODFATHER and GODMOTHER: in prelatical churches, persons who, by solemnly presenting to the minister the candidate for baptism, which is regarded as a new spiritual birth, is reputed to contract toward the newly baptized the relation of spiritual paternity or maternity. The effects of the usage are differently estimated in the different communions.—In the Rom. Cath. Church, the parties presenting a child for baptism are called, from the spiritual *parental* relations which they contract, 'godfather' (*patrinus*) and 'godmother' (*matrina*); and from the *engagement* into which they enter on behalf of the baptized, 'sponsors' (*sponsores*). The spiritual bond resulting from this relation is regarded as a species of kindred (whence the name *gossip,* or God-sib, *spiritually akin*), and constitutes, by the canon law, an impediment of marriage between the sponsors upon the one hand, and the baptized and the parents of the baptized on the other. Anciently,

this impediment arose also between the sponsors themselves, who were often very numerous, and extended besides to the other members of the kindred; but the Council of Trent limited the number of sponsors to 'one or two,' and restricted the matrimonial impediment within the limits above described. The parents of the baptized are not permitted to act as sponsors in the Rom. Cath. Church, one of the objects of the institution being to provide instructors in case of the death of parents; nor are members of religious orders, because their inclusion within their convent is supposed to render it impossible for them to discharge permanently and regularly the duties of instructors to the newly baptized. In the Rom. Cath. sacrament of confirmation also, the candidate is commonly presented by one sponsor, usually, though not necessarily, of the same sex with the candidate for confirmation. It is difficult to assign the precise date of the origin of the institution of godparents: no trace of it occurs in the New Testament, but it is believed to have been in use in the 2d c., and it was an established practice in the fourth.—In the Church of England, two godfathers and a godmother are required at the baptism of a male, and two godmothers and a godfather at that of a female. In order to be admitted as such, the person must be baptized, must be of full age, acquainted with the Lord's prayer, creed, and ten commandments, and familiar with the fundamental truths of Christianity. No impediment of marriage arises in the English church from the relation of the sponsors to the baptized. Practically, the usage in the Church of England has, for the most part degenerated into a mere form; godfathers and godmothers usually giving themselves little concern in the future fate of the infant whose spiritual condition they bind themselves to watch over. They are regarded as fulfilling a graceful office of friendship. In the Church of Scotland, and other non-Episcopal churches, there are no godparents; the parents of an infant are the sponsors, expressly taking the vows on the occasion.

GODFREY OF BOUILLON, *gŏd'frĭ ŏv bô-yōng*, Duke of Lower Lorraine: abt. 1061–1100; b. Baisy, village of Belgian Brabant: eldest son of Count Eustace II. of Boulogne, and of Ida, sister to Gottfried or Godfrey, the Hunchback, Duke of Lower Lorraine and Bouillon, whom he succeeded in the govt. of the latter duchy 1076. He served with great gallantry in the armies of Emperor Henry IV., in Germany and Italy; and it was from his hand that the competitor for the imperial crown, Rudolf of Swabia, received his death-blow at the battle of Merseburg. When the first Crusade was set on foot, the fame of his exploits caused him to be elected one of the principal commanders. To defray the expenses of the crusade of 1095, he mortgaged Bouillon to the Bp. of Liège, and set out, accompanied by his brothers Eustace and Baldwin, in the spring of 1096. For a detailed account of his career till the taking of Jerusalem, see CRUSADES. Eight days after the taking of Jerusalem, Godfrey was proclaimed king by the unani-

mous voice of the crusading army; but the piety and humility of the conqueror forbade him to 'wear a crown of gold where his Savior had worn one of thorns.' He declined the title, contenting himself with that of Defender and Guardian of the Holy Sepulchre. The sultan of Egypt, learning that the army of 300,000 crusaders who had taken Antioch had dwindled to 20,000, advanced against them with an army said to have amounted to 400,000 men: but Godfrey gave him battle in the plain of Ascalon, and gained a victory which put him in possession of the whole of Palestine, a few fortified towns only excepted. He now directed his endeavors to the organization of the new state; he installed a patriarch, founded two cathedral chapters, built a monastery in the valley of Jehoshaphat, and drew up laws. At his death his body was interred on Mount Calvary, near the Holy Sepulchre. History represents this prince as a model of piety, valor, and all kingly virtues; and his praises have been worthily sung by Tasso in his *Jerusalem Delivered.*

GODFREY, Thomas, American mathematician and mechanician: b. Philadelphia 1704; d. December 1749. He was a glazier in his native city; but accidentally meeting with a mathematical treatise, was delighted with the study, mastered all the books on the subject that he could obtain, and instructed himself in Latin in order to read mathematical works in that language. He borrowed a copy of Newton's 'Principia' from James Logan, secretary of the commonwealth, and in 1730 communicated to him an improvement that he had made in the quadrant. In 1732 Logan gave an account of the invention to Dr. Edmund Halley, of England, in a letter. No answer was received after an interval of a year and a half, and then the invention of Godfrey was laid before the Royal Society by the botanist Peter Collinson. Meantime, in 1731, Halley had presented a paper containing a full description of an improvement of the quadrant similar to that of Godfrey. The rival claims were investigated by the Royal Society, and it was decided that they were both entitled to the honor of the invention, and a reward of £200 was bestowed on Godfrey. Franklin observed of Godfrey that, like most great mathematicians whom he had met, he was not a pleasant companion, since he expected universal precision in everything said, and was perpetually denying or distinguishing on trifles, to the disturbance of all conversation.

GODIVA, *gō-dī'va*, Lady: patroness of Coventry, England. About 1040, Leofric, Earl of Mercia, and Lord of Coventry, then an important market-town, imposed certain onerous services and heavy exactions upon the inhabitants, of which they loudly complained. His wife, the Lady Godiva, having the welfare of the town at heart, besought her husband to give them relief, and was so earnest in her entreaties, that at length, to escape her importunities, the earl said he would grant her the favor, on condition that she would ride naked through the town, supposing himself

to be requiring an impossible condition; but he was surprised with the answer: 'But will you give me leave to do so?' As he could not in justice refuse, she ordered that proclamation be made that on a certain day no one should be away from home and that none should even look from their houses, when, clothed only with her long hair, she rode through the town; and her husband, in admiration of her intrepid devotion, performed his promise. This event was commemorated by a stained-glass window, mentioned in 1690, in St. Michael's Church, Coventry; and the legend that an unfortunate tailor, the only man who looked out of a window, was struck blind, also has found commemoration in an ancient effigy of 'Peeping Tom of Coventry,' still seen in a niche of one of the buildings. By a charter of Henry III., 1218, a fair is held at Coventry, beginning on Friday of Trinity-week, and lasting eight days. The fair was opened with a grand civic procession, a part of which was, in 1678, the representation of the ride of Lady Godiva. These processions were continued at intervals of three to seven years, until 1826. Some beautiful woman, who represented Lady Godiva, was the principal figure, but many other historical and emblematic personages were introduced. In 1907 the procession was revived but the vulgarity of former times was entirely eliminated.

GODKIN, *gŏd'kĭn*, Edwin Lawrence: journalist; 1831, Oct. 2—1901, May 20; b. in Ireland. Graduated at Queen's College, Belfast, 1851, was war correspondent for the London *News* during the Crimean war, came to the United States as correspondent for the same paper 1856, studied law and was admitted to the bar in New York 1859, practiced a few years, visited Europe, returned to the United States 1862, and was correspondent for the London *News* and New York *Times* during the remainder of the civil war. In 1865, July, he established *The Nation*, and became its editor. In 1881 it was made the weekly edition of the New York *Evening Post*, Godkin becoming one of the editors and proprietors of both publications.

GODOLPHIN, *go-dŏl'fin*, Sydney, Earl of Godolphin; abt. 1640–1712, Sep. 15; of an old Cornish family: English statesman. After the Restoration he became one of the grooms of the bed-chamber to Charles II., was appointed one of the secretaries of state 1664, and soon afterward first commissioner of the treasury; was twice despatched to Holland 1678 on business of importance; and argued and voted for the exclusion of the Duke of York from the succession, 1680. Nevertheless, when the latter mounted the throne, Godolphin (now Baron Godolphin of Rialton, in Cornwall) was made lord-chamberlain to the queen; and on the landing of the Prince of Orange, he was one of the commissioners sent by King James to treat with the invader—a difficult business, which he is considered to have managed with much tact and prudence. William was not slow to perceive the admirable abilities of Godolphin, and 1690 appointed him first lord of the treasury. In 1695 he was one of the seven lords justices for the administration of

the govt. during the king's absence. In 1702, on the accession of Anne, he accepted the office of lord high treasurer, mainly at the solicitation of Marlborough, who paid him a splendid compliment by declaring that otherwise he could not venture to assume the command of the British armies, as he could depend on him alone for punctual remittances. Godolphin fully realized the expectations of the great Captain. He raised the public credit, induced the queen to contribute £100,000 toward the war, firmly opposed the selling of offices and places, and increased the stipends of the inferior clergy. In 1706, Godolphin was raised to the dignity of Earl of Godolphin and Viscount Rialton; after this period he took part with the Whigs, as being more patriotic and English than the Tories. The contest between him and Harley for the premiership, resulted finally in the defeat of Godolphin, who was dismissed from office 1710. He died at St. Albans, and was interred in Westminister Abbey. The title became extinct in his son Francis, second Earl of Godolphin. Godolphin was the best business-man on record in his age.

GODON, Sylvanus William, u.s.n.: 1809, June 18—1879, May 10; b. Philadelphia. He was appointed a midshipman in the U. S. navy 1819, Mar. 1, promoted passed midshipman 1827, commissioned lieut. 1836, promoted commander 1855, capt. 1861, commodore 1863, rear-admiral 1866, and retired 1871. He served through the Mexican war, most of the time in command of the bomb-vessel *Vesuvius*, commanded the *Powhatan* in the successful attack on Port Royal, and commanded the 4th division of the fleet (on the *Susquehanna*) in the two bombardments of Fort Fisher 1864, Dec., and 1865, Jan. After the war he commanded the Brazilian squadron 1866–7, and the Brooklyn navy-yard 1868–70. He died in Blois, France.

GODOY; see Alcudia.

GOD SAVE THE KING (or QUEEN): national anthem of Great Britain. The tune is known as *America*, in the United States, and was by adoption the national air until *The Star Spangled Banner* was chosen. Its origin has been a subject of controversy. Its words are apparently imitated from the Domine Salvum of the Rom. Cath. church service. In England, the authorship has been generally attributed though with no proof, to Dr. John Bull (q.v.; 1563–1628). Chappell, in his *Popular Music of the Olden Time*, and Dr. Fink, German musical antiquary, are considered to have settled the question; the honor of this great work, both words and melody, must be given to Dr. Henry Carey, English poet and musician, (b. London about 1696, died 1743). The words and music were composed in honor of a birthday of George II., and performed for the first time at a dinner given on that occasion in 1740 by the Mercers' Company of London. The words and music were published first in the *Harmonia Anglicana*, 1742, and appeared in the *Gentleman's Magazine*,

1745. The air, according to Dr. Arne, has preserved its original form, but its harmonies have been modified by various artists; and the words were changed on the accession of William IV., and on that of Queen Victoria.

GOD'S TRUCE [Lat. *Treuga Dei*, or *Treua Dei*, from the Ger. *treu*, true]: one of the most singular among the institutions of the middle ages, which prevailed specially in France and the Germanic empire but was received for a time also in the other countries of Europe. It consisted in the suspension for a stated time, and at stated seasons and festivals, of that right of private feud for the redress of wrongs, which, under certain conditions, was recognized by mediæval law or usage. Private feuds, it is true, could, by the mediæval law, called *Faustrecht* and *Fehderecht*, be undertaken only when judicial redress had failed or could not be enforced, and after formal notice had been served upon the party against whom they were levied. But even with this limitation, private feuds multiplied exceedingly. The public peace was subject to constant interruption; the weak were without resource; the strong bore down all by the terror of their arms; and the whole social framework was so utterly disorganized, that men, by one of those religious impulses of which that age offers so many instances, fell back on the aid of the church, and invoked her influence, as the only effectual stay of the evil. In this crisis the 'God's Truce' originated. In the end of the 10th c., a council assembled at Limoges, at which the princes and nobles bound themselves, by solemn vow, not only to abstain from all unlawful feuds, but also to keep the peace mutually toward each other, and to protect from violence all defenseless persons, clerics, monks, nuns, women, merchants, pilgrims, and tillers of the soil. A similar engagement was entered into in a council at Orleans 1016; and the whole body of the bishops of Burgundy enforced it upon their flocks everywhere throughout that duchy. A plague which visited a great part of Europe soon afterward gave a fresh impulse to the movement; and in 1033, the 'Holy Peace' was almost universally received, and for a time was religiously observed. But as the old abuse began to revive by degrees, it was felt that the observance would carry with it more of religious authority, if, instead of being, as it had originally been instituted, universal, it was limited to particular times and days, which themselves had certain religious associations connected with them. Accordingly, 1041, the bishops of Aquitaine limited the God's Truce to the week-days specially consecrated by the memory of the Passion and Resurrection of Christ—that is, from the sunset of Wednesday to sunrise of Monday. The same decree was renewed at Narbonne 1054, and at Troyes 1093. At Clermont, 1095, it was extended to the whole interval from the beginning of Advent to the Epiphany, and from the beginning of Lent to Pentecost, to which seasons were afterward added several other festivals. These enactments were adopted or renewed at several later councils; and though they were often disregarded, they doubtless had a wide and lasting influence in mitigating the frightful evil against

which they were directed. This singular institution fell gradually into disuse, and at last disappeared altogether, when the right of private redress was restricted, and at last entirely abolished, by the law of the empire.

GODWIN, *gŏdwĭn*, MARY WOLLSTONECRAFT: 1759, Apr. 27—1797, Sep. 10; b. Beverly, Yorkshire, England: author. She received a meagre education, by her own exertions fitted herself to be a teacher, opened an improved day-school in Islington 1183, and afterward became governess to Lord Kingsborough's daughters. After the last engagement she turned her attention to literary work and made many translations from the French. She went to Paris 1792 to witness the revolution, and while living there entered into marital relations with Gilbert Imlay, an American author, who cast her off after a child was born. She twice attempted suicide. In 1797 she married in London William Godwin, a novelist and political writer, and the same year died after giving birth to the future wife of Percy Bysshe Shelley. Her writings include *Thoughts on the Education of Daughters* (1787); *Original Stories from Real Life* (1791); *An Historical and Moral View of the Origin and Progress of the French Revolution, and the Effects it has produced in Europe* (1790); *Vindication of the Rights of Woman* (1792); *Vindication of the Rights of Man* (1793); *Mary; a Fiction* (1796); *Letters written during a Short Residence in Sweden, Norway, and Denmark* (1796); and *Posthumous Works*, 4 vols. (1798).

GOD'WIN, PARKE: author: b. Paterson, N. J., 1816, Feb. 25. He graduated at Princeton College 1834, studied law and was admitted to the bar in Ky., returned to New York and married the eldest daughter of William Cullen Bryant, and was editor of the *Evening Post* 1837–53. He contributed to the *Democratic Review*, edited *Putnam's Monthly*, was deputy-collector of the port of New York under Pres. Polk, was an early member of the republican party, but has always advocated free trade. His writings include *Popular View of the Doctrines of Charles Fourier* (1844); *Constructive Democracy* (1851); *Vala*, a Mythological Tale (1851); *Handbook of Universal Biography* (1851); *Political Essays* (1856); *History of France*, 1st vol. (1861); *Out of the Past* (1870); *Cyclopædia of Biography* (1871); translation of a portion of Goethe's *Autobiography;* and a complete edition of William Cullen Bryant's writings in prose and poetry, 6 vols. (1883–4). **D. 1904, 7 Jan.**

GOD'WIN, WILLIAM: 1756, Mar. 3—1836, Apr. 7; b. Wisbeach, in Cambridgeshire: English author. His father and grandfather were Presb. ministers, and he was educated to the same profession, first at a school at Norwich, to which place his father had removed 1767, and later at a Presb. college at Hoxton, he pursued his theological studies. 1778–83 he was minister to a congregation in the neighborhood of London; but his zeal declined, his theological views changed, and he resigned his charge. His only resource was to remove to the metropolis and engage in literature. His first work, a series of *Historical*

Sketches, in the form of sermons, was unsuccessful, and he was reduced to penury and almost to despair; but his sketches made him acquainted with Fox, Sheridan, and other Whig leaders, and he turned to politics. The American revolution, closely followed by that of France, excited the public mind, and G. wrote *Inquiry Concerning Political Justice*, 1793. This was followed by *The Adventures of Caleb Williams*, a remarkable novel, intended to illustrate the political views advanced in *Political Justice*. An able defense of Horne Tooke and others, published in the *Morning Chronicle*, advanced his reputation; and in 1797, he published *The Inquirer*, collection of essays on morals and politics. About this time, he formed an alliance with Mary Woolstonecraft, the celebrated author of the *Rights of Woman*, and adopted and defended her extreme social views. After some months, however, the twain yielded so far to custom as to be married. His wife died a short time afterward in giving birth to a daughter, who afterward became the second wife of the poet Shelley. In 1799, he published *St. Leon*, a romance; and the next year visited Ireland, where he associated with Curran, Grattan, and other eminent Irish political leaders. He also wrote his wife's memoirs. In 1801, he married again; and for more certain support, G. and his wife opened a bookstore and circulating library, but he also worked indefatigably with his pen to the end of his life. He wrote many schoolbooks, an admirable *Life of Chaucer* (1801); *Fleetwood*, a novel, 3 vols. (1805); *Mandeville* (1817); *Treatise on Population*, a refutation of Malthus (1820); *History of the Republic of England*, 4 vols. (1824–28); *Cloudesley* (1830); *Thoughts on Man* (1833). As he gew old, he modified his opinions on politics and society, and especially on marriage, which he warmly commends in some later works. Being now 77 years old, he was appointed to a place under government which removed him from the apprehension of want. Many of his works were translated into foreign languages. Shelley put himself under G.'s guidance, and Edward Lytton Bulwer, afterward Lord Lytton, formed his earliest romances on the style of those of Godwin.—See *William Godwin*, by C. Kegan Paul (1876).

GODWINE, *gŏd'wĭn*, Earl of Wessex: famous Saxon noble, b. near the end of the 10th c.; d. 1054, Apr. 7: prob. son of Wulfnoth, a south Saxon. G. became the leading Englishman in the first half of the 11th c., and was father of the last king of the English native stock. He ingratiated himself with Ulfr, brother-in-law of King Canute, the latter gave him his daughter in marriage, and he soon became one of the most powerful of the English nobles. More than any other person, he contributed to the elevation of Edward to the English throne (1044); and the principal reward of his services was the marriage of his beautiful and accomplished daughter Editha with the English king. This union, however, was not happy. Editha was cruelly neglected by Edward, and her father, by his dislike of the Normans, incurred the royal enmity. His estates were

seized, and then given to favorites, and he and his family fled. Queen Editha was made to feel even more bitterly the misfortunes of her family. Her husband seized her dower; he took from her her jewels and her money, 'even to the uttermost farthing;' and allowing her only the attendance of one maiden, he closely confined her in the monastery of Wherwell, of which one of his sisters was lady-abbess. Meanwhile, throngs of Normans visited England to make or rather get fortunes. Among Edward's most favored guests for a time was Duke William of Normandy, later known as William the Conqueror. The banished earl, however, had not been idle; through frequent correspondence with his countrymen at home, he kept alive the antipathy of the English to the Norman favorites of Edward, and in the summer of 1052 he landed on the southern coast of England. The royal troops, the navy, and vast numbers of the burghers and peasants went over to him; and finally the king was forced to grant his demands. The Normans were for the most part expelled from the country, the G. family was restored to all its possessions and dignities; and at a meeting of the Witenagemôte, 'the earls and all the best men of the land' declared that the foreigners alone were to be held guilty of the late dissensions that had distracted the country. His son Harold was for a few months Edward's successor on the throne.

GODWIT, n. *gŏd'wĭt* [word of unknown origin], (*Limosa*): genus of birds of the family *Scolopacidæ*, with very long bill, slightly curved upwards, and long slender legs, great parts of the tibia bare. All the species frequent marshes and shallow waters, chiefly those of the sea-coast, where they seek their food by wading and by plunging the long bill into the water of mud like snipes. They sometimes

Bar-Tailed Godwit (*Limosa rufa*).

run after small crustaceans or other animals, and catch them on the sands, from which the tide has retired. The Black-tailed G. (*L. melanura*) and the Bar-tailed G. (*L. rufa*), both birds of passage, are species very widely distributed over Europe, Asia, and Africa. They breed in

Lapland and the far north. The females are rather larger than the males, and the whole length of the female black-tailed godwit, the largest species, is about 17 inches, the bill alone being four inches long. They are much esteemed for the table, and are sent from Holland to the London market, which receives some also from the fens of Lincolnshire.—There are two American species; the Marbled Godwit, or Marlin; and the smaller Hudsonian godwit, whose range seems to extend over the whole continent, though it is not found in great numbers.

GOEBEN, *gō'bėn*, AUGUST VON: Prussian gen. of inf.: b. Stade, Hanover, 1816, Dec. 10; d. 1880, Nov. 13. He entered the army as lieut. 1833, but soon resigned for want of more active employment, and took service with the Carlists in Spain, where he was several times wounded, taken prisoner, confined in jail in Cadiz and Saragossa, and at the close of the war liberated. He then returned to Germany, published a book on the Carlist war; re-entered the army, and received an appointment on the staff. From 1849, when he served in the Baden campaign, till 1855 he was on the staff of the crown prince (William I.), and in the latter year became chief of the staff of the 6th corps. In 1860 he was Prussian reporter of the Morocco campaign and attached to the staff of the Spanish gen. O'Donnell; 1863 was appointed commander of the 26th brigade of inf.; 1864 was commander of the 10th division in the war against Denmark; and 1865 promoted lieut. gen. and commander of the 13th division. He was active in the Franco-German war 1870–71, as commander of the 8th corps at Saarbrücken and Metz, and of the army of the north, which defeated the French under Gen. Faidherbe at St. Quentin 1871, Jan. 19.

GOEPP, PHILIP HENRY, American musician: b. New York 1864, June 23. He was graduated from Harvard in 1884, and was admitted to the bar in Philadelphia in 1888, but turned his attention exclusively to music in 1891, and became active as organist, composer, and instructor. He has published anthems, songs, and part-songs, written some instrumental works yet in MS., and is the author of *Annals of Music in Philadelphia* (1896); *Symphonies and Their Meaning* (1898): etc.

GOES, *ċhôs*, HUGO VAN DER: about 1420–82; b. Bruges: painter. He was a pupil of Van Eyck, attained considerable celebrity while living in Ghent, and spent the closing years of his life in a monastery near that city. His best known works are an altar-piece in the chapel of the hospital of Santa Maria Nuova in Florence, and the *Crucifixion* in the church of St. James in Bruges. He excelled in delineating female beauty.

GOETHE, *gö'ṫėh*, JOHANN WOLFGANG VON: acknowledged prince of German poets, one of the most highly gifted and variously accomplished men of the 18th c.: 1749, Aug. 28—1832, Mar. 22; b. Frankfort-on-the-Main, where his youthful years were spent. His father, Johann

Kaspar Goethe, was an imperial councilor in good circumstances, and in a respectable position. In 1765, Goethe went to the Univ. of Leipsic, of which Ernest and Gellert were then notable ornaments. As a student, he pointed, by external profession, toward the law; but his real studies were in the wide domain of literature, philosophy, and above all, life and living character. In 1770, he went to Strasburg, to finish his juridical studies; but here also anatomy and chemistry, Shakespeare, Rousseau, and architecture—anything rather than the statute-book—occupied his time and exercised his soul. Here the most famous of his youthful love-adventures took place.

He had already written poems, and was gradually to become the most universal genius of the time—peot, biographer, physicist, archæologist, critic, and king of literature. We here give summarily the name of the chief of his works, reserving some of them for brief criticism below. (1) The first period of his literary life has been called the sentimental, or storm and stress period, 1770–76. To it belong *Götz, Werther, Prometheus;* the dramas, *Clavigo, Stella, Die Geschwister;* the dramatic farces, *Gods, Heroes, and Wieland,* with many shorter pieces, and some of the songs. (2) The ideal period (1776–1808) comprises *Egmont, Iphigenia, Tasso; Wilhelm Meister's Apprenticeship;* two operattas, one or two political comedies; the first part of *Faust;* the *Roman Elegies;* Ballads, the *Xenien;* the novels *The Natural Daughter,* and *Elective Affinities.* (3) The didactic period, into which fall the autobiographical *Truth and Fiction; Westöstlicher Divan; W. Meister's Journeymanship;* the second part of *Faust;* also *Letters from Switzerland; The Campaign in France; the Italian Journey;* a work on *Winckelmann;* the famous works on *The Metamorphosis of Plants, On the Theory of Colors,* and *On Optics;* the magazine, *Science and Antiquity;* besides his version of *Reineke Fuchs, Benvenuto Cellini,* and translations.

In 1771, the youung poet, 22 years of age, took his degree as doctor of laws, and went for a while to Wetzlar on the Lahn, seat of the imperial chamber of the then German empire. But for him Wetzlar was mainly the scene of the famous *Sorrows of Werther,* a glowing leaf from the life of the human soul, full of interest and beauty at all times, but which, in the then state of European thought and feeling, stirred the whole literary mind of Europe like a breeze sweeping over a forest. The book was not published till 1774. Goethe spent some years in his native city, engaged chiefly in literary productions. His first great work was *Götz von Berlichingen,* translated into English by Sir Walter Scott, published Frankfurt, 1773, which at once set the Germans free from the painful constraint of French and classical models, and opened to them that career of bold originality, which they have since prosecuted in so many departments of literature, learning, and speculation. In 1775, Goethe, who had had the good-fortune to gain the good opinion of Karl August, Grand Duke of Saxe-Weimar, accepted an invitation from

that prince to settle in his little capital, since become so famous as the Athens of the great legislative age of German literature. Here the poet became a little statesman; and occupying himself in various ways in the service of his benefactor, passed quickly through stages of court preferment, till, 1779, he became 'actual privy-councilor,' at the age of 30, holding the highest dignity that a German subject could then attain; a great, a rich, and an influential man. In 1782, he received a patent of nobility; and in the following years, till 1788, travelled much in Switzerland and Italy, of which last journey we have the beautiful fruits in *Iphigenia, Egmont, Tasso,* and the *Venetian and Roman Elegies.* Of this last work, thoroughly German both in form and feeling, the heroine was Christiana Vulpius, a highly attractive though not highly gifted woman, who bore him a child—his eldest son—in 1789; but whom, though he always treated her as his wife, he did not formally marry till 1806. In 1792, he took part in the German campaign against France, of which he has left a memoir. In 1815, he was made minister of state. After the death of the grand duke, 1828, he lived much in retirement, occupied occasionally with poetry, but much more intensely and constantly with the study of nature and the fine arts, which from his earliest years had possessed the strongest attractions for him. He died in his 84th year.

For the literary and scientific productions of Goethe's pen, the best source of reference to the English reader is the biography of the poet, by G. H. Lewes; with which may be taken Goethe's interesting conversations with Eckermann, translated by Oxenford; the latest work on this line is Bielschowski's *Leben Goethes,* which appears in English. We turn to his general character and literary position. It is as a poet that this remarkable man is generally known and recognized by English readers; but it is not as a poet only that a just measure can be taken of his intellectual calibre or of his European and wider significance. It is as poet, thinker, critic, and original observer of nature, all in one admirable harmony, that his rare excellence consists. We do not find in literary history any intellect that can fitly be placed on the same platform with Goethe; that presents, in such grand and graceful completeness, so much severe thought, combined with so much luxuriant imagination; so much accurate science with so much playful fancy; so much simplicity with so much art; so much freshness and originality of productive power, with so much justness and comprehensiveness of critical judgment. As a dramatist Goethe will not compare for a moment with the great English masters of that art. His English biographer detects in the constitution of his mind, most justly, 'a singular absence of historic feeling and dramatic power.' Not less correct is the judgment of the same writer when he says: 'Goethe was attached to character and picture, indifferent to action and event.' In this respect, the poet was a true type of his nation. As contrasted with the French and English,

the Germans are deficient in nothing so remarkably as in stirring passion and progressive energy; the relation of Goethe to Shakespeare and the English dramatists, is exactly the same. Nevertheless, *Faust* is a great poem, even a great dramatic poem, for it is full of dramatic scenes, though they are not sufficiently moved by the living current of dramatic action. *Faust* is essentially a German poem, yet a poem which all foreigners can read and enjoy. It is the great drama of that moral and metaphysical questioning which thoughtful minds must go through in all times and places, but which has received the fullest and most fruitful development in modern Germany. Of the other poetical works of Goethe, *Iphigenia, Hermann and Dorothea,* and *Tasso,* are those which most strongly bear the type of the ripe manhood of the author. The form and style of these classical works are characteristically Greek; by which we mean they are remarkable chiefly for profundity of thought and truth of feeling, expressed in the most simple, graceful, and unpretending manner. In soul, however, they are essentially German; and the most deep-thinking of the Germans are always the first to claim Goethe as the most German of all German poets in spirit, though very few great German writers have so carefully avoided the most characteristic German defects of style. In the extraordinary value which he attaches to 'the form,' Goethe authenticates himself everywhere as at once a great modern Greek and a great artist.

Goethe is a poet thoroughly relished only by those who understand thoroughly the German language, and whose minds are not so typically English or American or French as to exclude a ready sympathy with German thoughts and feelings. With general English readers, for various reasons, Schiller will always be the favorite poet. Nevertheless, there has been a considerable amount of literary power in other countries spent in the translation of Goethe's works, specially of his great work, the *Faust;* of this, about 40 English translations exist, the most notable being by Bayard Taylor, Anster, Blackie, and Hayward. Some of the most beautiful of the lyric poems have been aptly rendered in a conjunct volume by Prof. Aytoun and Theodore Martin. See Grimm, *Goethe.* Translated by Miss S. H. Adams, *The Life and Times of Goethe* (Boston '79–81).

GOETHITE, n. *gāth'īt* [named in honor of *Goethe,* the great German poet]: an ore of iron found in crystals of a reddish and blackish bronze color; hydrous peroxide of iron.

GOETZ, Theodor von, German painter: b. Lieschen, Siberia, 1826; d. 1892. He began as a genre painter, but in 1848 entered the army and during the Schleswig-Holstein campaigns filled his portfolio with sketches of march and battle. He thenceforward devoted himself to painting military scenes, and became renowned as a battle painter. He took part in the Franco-Prussian war of 1870–1, and painted many striking incidents of the campaign.

GOFF, NATHAN: lawyer: b. Clarksburg, W. Va., 1843, Oct. 9. He was educated at the Northwestern Virginia Acad. and graduated at the law school of Columbia College. He served through the civil war in the Union army, was captured and confined in Libby prison six months, and became brig.gen. of volunteers. In 1865 he was admitted to the bar and elected a member of the W. Va. legislature, 1868–81 was dist.attor.; 1881 was appointed sec. of the navy to fill a vacancy, and the same year reappointed dist.attor.; and 1884, 86 was elected a member of congress as a republican. He was defeated for congress 1874 and for gov. 1876. In the state election 1888 he was the republican candidate for gov. and claimed the election. The claim was disputed, owing to the failure of the speaker of the house of delegates to declare the person elected who had received the highest number of votes. Both Goff and the pres. of the senate were sworn in as gov., but Gov. Wilson declined to surrender the office 1889, Mar. 4, and the matter was taken to court, which awarded the office to Goff's opponent, Judge A. B. Fleming. Goff was appointed a U. S. circuit court judge 1891.

GOFFE, *gof*, WILLIAM: about 1605–79; b. England: regicide. He was educated for commercial pursuits, but joined Cromwell's parliamentary army 1647, and became maj.gen. 1655. In 1649 he was made master of arts by Oxford College, 1654 elected member of parliament from Yarmouth, and 1656 from Southampton; was appointed to a seat in the house of lords by Cromwell, and was so popular that he was spoken of as the successor to the protectorship. Having been one of the regicide judges, with Edward Whalley, his father-in-law, both fled to America on the news of Charles's return, and settled in Cambridge 1660, July 27. They were excluded by name in the parliamentary act of amnesty, and 1661–64, lived in concealment near New Haven, part of the time hiding in a cave in West Rock, and several times narrowly escaping arrest by crown officers. In 1664 they went to Hadley, Mass., where with John Dixwell (q.v.), a third regicide, they were protected by the Rev. Mr. Russell. A pleasant and long-current narrative of Goffe's saving Hadley from destruction by Indians is now regarded as fiction.

GOFFER, v. *gŏf'fėr* [OF. *gauffrer*, to adorn a garment with puffs: Scot. *goupher*, to puff]: to pucker; to plait; to flute, as linen and lace. GOF'FERING, imp.: N. the operation of puckering or plaiting. GOF'FERED, pp. *gŏf'fėrd*. See GAUFFERING.

GOG, *gŏg*, AND MAGOG, *mā'gŏg:* names several times used in the Bible: also the names given to the famous figures of giants in Guildhall, London.—Magog is spoken of, Gen. x. 2, as a son of Japhet; Ezekiel (xxxviii., xxxix.) speaks of Gog, prince of Magog; Gog and Magog are spoken of in Rev. xx. Magog is considered by many modern writers as a geographical designation; and Gog as the father of the Scythians and Tartars. Under the name Scy-

thians it was customary to group several rude and barbarous nations supposed to dwell in a vast region n. of the Caucasus, whose savage inroads were the terror of civilized lands in the ancient world. Thence the word came to be used irrespectively of land or nationality, as the type of dark, gigantic, obstructive, and injurious power of which the giant leader or father of the Scythians may, it is thought, have been taken as the personification. If this view be adopted, then in the vivid style of prophecy, 'Gog and Magog' may denote the leader of the world's evil, with all his hosts mustered for the final conflict. The Caucasus is suppose by Bochart to derive its name from Gog Chasan—fortress of Gog.

The Guildhall giants boast of almost as high an antiquity as the Gog and Magog of the Scriptures, as they, or their living prototypes, are in legend said to have been found in Britain by Brute, younger son of Anthenor of Troy, who invaded Albion, and founded the city of London, at first called Troy-novant, 3,000 years ago. Albion, at this period, was inhabited by a race of tremendous giants, descendants of the 33 infamous daughters of the Emperor Diocletian, who having murdered all their husbands, were sent to sea in a ship, and were happy enough to reach Albion, where, cohabiting with wicked demons, they gave birth to the giants, whom the Trojans finally conquered, leading the last two survivors prisoners to London, where they were chained to the gates of a palace on the site of Guildhall, and there kept as porters. When they died, their effigies were set up in their place. This is Caxton's account; but there is another, which represents one of the giants as Gogmagog, and the other as a British giant who killed him, named Corineus. However the fact may have been, the two giants have been the pride of London from time immemorial. On London Bridge, they welcomed Henry V. 1415; they welcomed Henry VI. to London 1432; and 1554, Philip and Mary. In 1558, they stood by Temple Bar, when Elizabeth passed through the city gate. The old giants were burned in the great fire, and the new ones were constructed 1708. They are 14 ft. high, and occupy suitable pedestals in Guildhall. The ancient effigies, made of wicker-work and paste board, were carried through the streets in the Lord Mayor's Shows, and copies of the present giants were in the show of 1837. Formerly, other towns in England had their giants, and there are famous and some very large ones in several continental cities. The Antigonus of Antwerp is 40 ft. high, and was formerly carried in the most solemn religious as well as civic processions. Gayant, the giant of Douai, is 22 ft. high. There are also giants, and families of giants, at Lille, Malines, Brussels, etc., each connected with some popular tradition of their respective cities. The arms of Antwerp, a castle with severed hands, are connected with the legend of the giant who lived in the castle, and cut off the hands of those who failed to pay his exactions. Though it is now impossible to ascertain the facts,

there can be little doubt that all these civic giants are exaggerated representatives of real persons and connected events.

GO'GARI: river rising in Nepaul, about lat. 27° 20′ n., and long. 86° 46′ e., and joining the Coosy, affluent of the Ganges, in lat. 25° 24′ n., and long. 87° 16′ e., after a course of 235 miles.

GOGGLE, v. *gŏg'l* [Gael. *gogach*, nodding, wavering, *gog*, a nod; allied to *cog*, *jog*, and *shog*, expressive of motion brought to a sudden stop]: to strain or roll the eyes: N. a strained or affected rolling of the eyes: ADJ. having full eyes; staring with rolling eyes. GOGGLING, imp. *gŏg'lĭng*. GOGGLED, pp. *gŏg'ld*. GOGGLES, n. plu. *gŏg'lz*, spectacles to cure squinting or keep off dust. GOGGLE-EYED, having large prominent eyes, which are constantly in motion.

GOGOL, *go'gol*, NIKOLAI VASILIEVICH: Russian author of great and original genius: 1809–52; b. at the village of Wassiljewka, govt. of Poltova. On finishing his studies he went to St. Petersburg, and solicited government employment, which was refused, on the ground, that 'he did not know Russian.' Shortly afterward he proved that the officials were in the wrong by publishing a collection of novels and sketches, entitled *Vechera na Khutorie* (Evenings at a Farmhouse). The first and most important of these tales contains a vivid picture of Cossack manners, enabling us, according to Saint-Beuve, to comprehend the profound antipathies that have for ages characterized the relations of certain branches of the Slavic family to each other. Then come the *King of the Gnomes;* the *History of a Fool*, more a satire than a psychological study; and *The House-keeping of Former Times*, a little masterpiece of its kind. The success of *Evenings at a Farmhouse* was immense, and Russian critics compared Gogol's style to that of Washington Irving. It was followed by *Mirgorod*, of the same character, containing stories full of poetry, showing grasp in the delineation of character, with skill in plot. Gogol then produced the *Revisor*, a brilliant comedy, whose purpose was to expose the rooted abuses of the internal administration of Russian affairs. Emperor Nicholas applauded its morality, and showed his approbation by appointing the author prof. of history in the Univ. of St. Petersburg. In 1842, Gogol published *Pokhozhdeniya Chichagova ili Mertvuiya Dushi* (Adventures of Chichagov, or Dead Souls, of which a poor translation appeared in English 1854, under the title of *Home-life in Russia*). The aim of this novel was to extinguish serfdom by ridicule. Gogol afterward went to reside in Italy, where his opinions appear to have undergone a change: he became an apologist of despotism, an apostasy which he lived to regret. After the commotions of 1848, he returned to Russia, and died at Moscow.

GOHILWAR′, or GOHELWAD′: region of Gujerat in India, comprising several tributary states: on the e. coast of the peninsula of Cattywar. The native states in the

'Gohilwar division' cover an area of about 3,000 sq. m. The soil is fertile. Most of the rivers are dry in the hot season; the Setroonjee is the largest river. The chief mountains are Wülluk, Palitayna, and the Servi ranges. The capital of Gohilwar, Bhaonagar, is within the British dist. of Ahmedabad. Pop. of Gohilwar about 120,000.

GOIL, *goyl.* Loch: small, highly picturesque loch in Argyleshire, Scotland; branch of Loch Long (q.v.); six m. in length, and about one m. in breadth. Its shores are mostly wild and rugged, but with extensive natural woods of hazel. The mountains in the neighborhood rise to about 2,500 ft. Lochgoilhead is a favorite summer watering-place: it may be visited by steamers from Glasgow.

GOITO, *gō'ē-to:* small town in Italy, province of Mantua, dist. of Volta; abt. 15 m. n.w. from Mantua, in a beautiful though somewhat marshy position on the Mincio. This town, owing to its vicinity to the stronghold of Mantua, has been the field of various military operations. In 1630, it was carried by assault by the imperialists, who entered Mantua on the same night, and took it by surprise; during the war of the Spanish Succession 1701, it was alternately captured by the allies and the imperialists; and in 1796 the French took it, but were expelled, after a brief tenure, by the Austrians. In 1814, a severe engagement took place at Goito between theAustrian and French troops; and during the war of independence 1848, it became the theater of two further battles between the same powers, to which it owes its modern celebrity. Pop. 3,600.

GOITRE, or Goiter, n. *goy'tr* [F. *goître*—from L. *gutter*, another form of *guttur*, a throat, the meaning in mid. L. is 'goitre']: enlargement of the thyroid gland (q.v.) occupying the front of the neck. The swelling is sometimes of such a size as to project downward over the chest. Goitre is mostly an endemic or local disease, being found in the mountainous regions of the Alps, Andes, and Himalayas, especially, it is said, where lime prevails largely as a geological formation. The proofs of goitre being connected with a calcareous impregnation of the drinking-water are, however, lacking. It is now generally believed that the disease is of microbic origin, the microorganism existing in the drinking-water. Goitre prevails also in Derbyshire, England, and is not uncommon in many parts of the United States and Canada. Goitre is more common in women than in men, in the proportion of from 8 to 20 to 1. Swelling of the thyroid gland may arise from a great variety of causes; it may be due to congestion, to simple tumor (adenoma), to the pressure of a cyst, or to a cancerous growth.

The treatment of goitre may be medical or surgical. The rubbing into the skin over the swelling of red iodide of mercury ointment is a favorite method and one that appears to be successful in a number of cases. The injection into the tumor of an emulsion of iodoform in ether and olive oil has been recommended. No internal remedy

is curative, though the administration of iodine or iodide of potassium has been followed by a diminution in the size of the swelling. The surgical removal of the tumor is a dangerous procedure, but it has occasionally been successful. In regions where goitre is endemic the water used for drinking should be boiled. When with enlargement of the thyroid gland, there is also palpitation of the heart and protusion of the eyeballs, the disease is that known as Exophthalmic goitre, Graves' disease, or Basedow's disease. GOITRED or GOITERED, a. *goy'trd*, affected with goitre. GOI'TROUS, a. *-trŭs*, affected or inclined to goitre.

GOLCONDA, *gŏl-kŏn'da:* fortress and ruined city in the Nizam's dominions, seven m. n.w. of his cap. Hyderabad; in lat. 17° 22′ n., and in long. 78° 25′ e. Near the fortress are the ruins of an ancient city, former metropolis of the kingdom of Golconda. The place itself is still strong; but its strength is seriouly impaired through its being overtopped, within breeching-range, by the yet sold mausolea of its former sovereigns, which form a vast group at a distance of 600 yards. These tombs are dome-crowned structures of gray granite, each having its own mosque, and occupying the centre of its own elevated terrace. Golconda is proverbially famous for its diamonds; but, in truth, they are merely cut and polished here, being generally found at Parteall near the s. frontier of the Nizam's dominions.

GOLD, n. *gōld* [Icel. *gull*, gold—from *gulr*, yellow: Dut. *goud;* Scot. *gowd;* Dan. *guld*, gold]: an elementary body; one of the precious metals, of a bright yellow color; money; riches; wealth: ADJ. made or consisting of gold. GOLDEN, a. *gōl'dn*, consisting of gold; bright; shining; of a gold color; excellent; happy or innocent, as the *golden age;* preeminently favorable. GOLDBEATER. n. *-bēt-ėr*, one whose trade is to make gold-leaf (see GOLD-BEATING: GOLD-BEATER'S SKIN). GOLD COAST (see GUINEA). GOLDFINCH, n. *-fĭnsh*, song-bird—so called from the color of its plumage (see below). GOLD-LEAF, gold beaten extremely thin (see GOLD-BEATING). GOLD'SMITH, n. a worker in the precious metals. GOLD-DUST, gold as found in fine particles. GOLDEN-HAIRED, having yellow hair. GOLDEN RULE, Christ's rule, Matt. vii. 12: 'All things whatsoever ye would that men should do unto you, even so do ye also unto them': also, in *arith.*, a process so called from the universality of its application (see PROPORTION). GOLD-FIELD, the district of a country where gold is found. GOLD-STICK, higher officers in the English body-guard, and captains in the corps of gentlemen-at-arms—named from the gilded baton which they carry on state occasions. GOLDEN HORN, the inlet or harbor of the Bosphorus on which Constantinople is situated—so named from its curved shape, and the glittering cupolas of the mosques around it. GOLDSMITH'S NOTES, earliest form of banknotes; so called because goldsmiths were the first bankers: see BANK-NOTES.

GOLD (symbol Au, atomic weight 197): a metallic ele-

ment with a characteristic yellow color and a high metallic lustre. The specific gravity is less than that of platinum and iridium, ranging from 19.2 to 19.4. It is nearly as soft as lead, and is the most malleable of all metals. It can be beaten into leaves of a thinness not exceeding $\frac{1}{280000}$ of an inch, through which light passes with a green tint; one grain may thus be distributed over nearly 80 sq. inches of surface; and the ductility of the metal is so great, that the same quantity may be drawn into 500 ft. of wire. In its tenacity, it is inferior to iron, platinum, copper, and silver; but a wire whose diameter is one tenth of an inch will support a weight of nearly 200 lbs. It melts at 1045° C., being somewhat less fusible than silver and more fusible than copper. It does not melt in a common fire. At high temperatures the metal is sensibly volatile, and in the intense heat of the oxyhydrogen blowpipe or electric furnace may be vaporized. The vapor is purple.

Gold has very little affinity for oxygen; it undergoes no change on exposure to the atmosphere, and is unaffected by hydrochloric, sulphuric, or nitric acid, or, in short, by any simple acid except selenic acid; nor do the alkalies affect it. Its usual solvent is *aqua regia*, which is generally prepared by mixing 1 part of nitric acid with 3 or 4 parts of hydrochloric acid. The chlorine liberated from this mixture converts the gold into the trichloride, an exceedingly soluble body of high tinctorial power, yielding yellow solutions. In the finely-divided state gold is dissolved by chlorine water, bromine water, and iodine solution or tincture, the trichloride, tribromide, and triodide being produced. It also dissolves in potassium cyanide solutions (in the presence of air) and in cyanogen bromide. These solvents are employed in the extraction of gold from its ores.

Gold alloys readily with most metals. It is rapidly attacked by mercury, and dissolves in excess of that metal. If the liquid amalgam be squeezed through wash-leather a yellow pasty mass remains, which may be used in 'wash' or 'fire' gilding. This process, however, has been largely displaced by electro-gilding, in which the bath consists of the double cyanide of gold and potassium, and is used hot. Gold in its pure state is too soft for the purpose to which it is generally applied, and for practical use in coinage and in the arts it is alloyed with copper or silver, both these metals being frequently present. The former renders the gold redder and the latter paler than its true color. The proportion of gold contained in an alloy is expressed in degrees of fineness, or as 'carats' and carat grains (4 grains = 1 carat). The fineness is expressed in parts per thousand, for example 916.6, or decimally, .9166. The carat value of the gold is expressed in parts of 24, pure gold being 24 carats fine. Thus 9-carat gold contains 9 parts of pure gold and 15 of a mixture of copper and silver, etc., commonly known as alloy.

Oxides of gold can be prepared with some difficulty.

The monoxide is thrown down when caustic potash is boiled with gold chloride solution to which a little acetate of soda has been added. A trioxide (Au_2O_3), a dioxide (Au_2O_2), and a tetroxide (Au_2O_4) are also known. What is known as fulminating gold, Au_2O_3 (NH_3), may be prepared by adding ammonia to a solution of gold chloride or by steeping the hydroxide in ammonia. It is a green or brownish powder, which detonates violently when gently heated or when struck. Two classes of gold salts exist. Of the aurous salts, the principal are sodium auro-sulphite, auro-thiosulphate, the cyanide and potassium auro-cyanide. Of the auric salts, the principal are the trichloride and the chlor-aurates. The chlor-aurates are combinations of gold chloride with sodium, potassium, and other alkaline chlorides. The best known are $KCl.AuCl_3.2H_2O$, and $NaCl.AuCl_3.2H_2O$, salts commonly sold as gold chloride for photographic purposes. Gold is precipitated from solution by most metals. Iron, copper, and zinc precipitate it readily, generally in a more or less pulverulent form devoid of metallic appearance. Oxalic acid, ferrous sulphate, sulphur dioxide, and sodium sulphite, carbon, grape-sugar, and many organic reducing agents, precipitate the gold from gold chloride. In some cases the metal is so finely divided that it imparts a ruby color to the liquid and does not settle for months. Purple of Cassius is the fine purple pigment produced by treating gold chloride solution with a mixture of tin chlorides, that is, stannous chloride containing a little stannic salt. It is used in glass staining, pottery, and enamel painting, and for coloring artificial gems, imparting a pink, rose, or red color.

Gold is usually found in nature in the metallic or native state, and may be distinguished from iron and copper pyrites and other yellow metallic minerals by its malleability and softness. Native gold is never pure. Its quality varies from about 800 to 950 fine, or about 20 to 23 carats. Electrum is a native alloy of silver and gold about 500 fine. A native amalgam with mercury also occurs. The metal sometimes occurs crystallized in octahedra and other cubic forms. It is also found in irregular masses which may be nodular, filiform, or arborescent, or it may form thin leaves merely gilding the surfaces of the rock. More commonly it exists in grains irregularly distributed through sand, gravel, or rock. These grains are sometimes so minute as to be invisible to the naked eye, and the presence of gold can only be detected by subjecting the rock to a careful assay, either by grinding with mercury, washing, or fire assay.

Gold was, in all probability, one of the earliest discovered of the metals. The fact of its being found very generally distributed over the surface of the earth, and that too, in its simple metallic state, combined with its beautiful color, and many valuable properties, would cause it very early to attract the attention of man. Accordingly,

we learn that gold was used by the Hebrews, the Egyptians and other ancient nations, for much the same purposes as at the present day.

At the beginning of the 19th century the most important gold producing countries were Mexico, Colombia, Peru, Brazil, and Argentine Rep., in the western hemisphere, and Russia and Hungary in the eastern hemisphere. With the exception of small quantities that were obtained in Africa and from the East Indies there were practically no other places where the metal could be found.

In 1829–38 extensive gold deposits were discovered in Siberia, and in 1848, the era of the discovery of gold in California began. In that year a Mr. Marshall found a small lump of gold in a mill-race in Eldorado County. Naturally such a discovery led to a search not only of the bed of the stream but in the adjoining ground, and, in both places, rich deposits of the precious metal were found. The news spread like wildfire through California, down the Pacific coast to South America, and finally east to the Atlantic States, and so to Europe. In response to these tidings gold hunters flocked from every inhabitable portion of the globe, with the result that the gold production of California alone amounted to $36,000,000, or a sum equal to that which the annual average of the entire world had attained during the preceding decade. In 1851, before the excitement of the California discovery had time to subside, the world was startled by the announcement of another, or rather by a series of other discoveries, of not less importance, in Australia. The first of these discoveries was made in New South Wales. A still richer deposit was found at Ballarat, Victoria, shortly afterward, and these in turn were surpassed by discoveries in the Mt. Alexander range. The finding of the Comstock lode in Nevada was the next great discovery of the precious metal. In 1884, there was discovered in the Witwatersrand of the Transvaal a deposit of gold that was destined to surpass in magnitude every other find of the precious metal that the world had ever seen. One of the most surprising discoveries of modern times, however, was the finding of the gold placers of the Klondike in 1894. As the ground underneath which this gold is found is perpetually frozen, it is quite evident that these deposits must have been laid down at some age when the climate of that region was much warmer than it is at present. To procure this gold to-day, however, it is necessary to sink a shaft through the frozen ground by the use of hot boulders, after which the drift is run by building a fire against the face of the ground, the gravel which is then thrown out being left until summer, when it will thaw sufficiently to permit of washing and panning. Similar placer mines were also discovered in the Cape Nome region of Alaska. In 1900 new workings were established in West Australia, and about 1905 some very productive districts in Nevada. The production of gold in 1908 was divided as follows:

GOLD.

Countries.	Value.
Australia	$ 73,327,300
Africa	166,520,500
United States	94,560,000
Russia	28,052,200
Canada	9,842,100
Mexico	22,371,200
India	10,598,500
China	8,647,300
All others	28,013,100
Total	$441,932,200

The production of the United States and its territories during 1908 was divided as follows:

State, etc.	Value.
Colorado	$22,871,000
California	19,329,700
Alaska	19,858,800
South Dakota	7,742,200
Montana	3,160,000
Nevada	11,689,400
Utah	3,946,700
Arizona	2,500,000
Idaho	1,443,500
Oregon	905,900
All others	1,112,800
Total	$94,560,000

Wherever gold is found its origin can generally be traced to quartz viens in the primary or volcanic rocks. As these rocks became decomposed by the action of the weather, portions of the auriferous veins were carried down by streams and floods, and so found their way into the deposits of sand, clay, and shingle in river-beds, and in the gullies and flats of hills. These deposits are known as alluvial deposits or placers, and as 'deep leads.' The former are found in valleys and plains along the courses of existing rivers or rivers of former ages; the latter consist of ancient river-beds that have been covered by more recent deposits of drift, earth, or volcanic rocks. They are composed of sand, gravel, loam and clay, the so-called 'wash-dirt' or 'pay-dirt' varying from a few inches to several feet in thickness. Gold is found in alluvial deposits in all degrees of coarseness, from minute specks or 'colors' to masses weighing many ounces. One of these, designated the 'Welcome Stranger,' found at Dunolly in Victoria, weighed 2,195 ounces troy, and many others of large weight have been found. These larger masses of gold have usually a more or less rugged and lumpy exterior, and are described as 'nuggets.' The largest usually occur near the source from which the gold in the alluvium has been derived. Alluvial deposits vary in character from pipe clay to coarse gravel. The gravel is usually loose, but sometimes in working the deposits intervening layers are met with which are cemented together. These are known as 'false bottoms'. River sands also frequently contain gold.

Where gold occurs in rocks, it is found almost invariably in veins of quartz, known also as 'lodes,' 'reefs,' or 'ledges.' The metal is not uniformly scattered through the rock,

but occurs in most cases in rich streaks and pockets. Careful examination will often reveal its presence, but no general appearance of the quartz can be relied on. Highly mineralized quartz is usually most productive. The minerals present most frequently are silver, zinc, lead, copper, iron, nickel, bismuth, tellurium and manganese-bearing minerals, especially iron pyrites. Ores of other metals frequently contain gold. Iron and copper pyrites, antimonite, galena and silver ores are often gold bearing. The precious metal is extracted in the smelting of the mineral. Gold occurs also in combination with tellurium and possibly with selenium, as well as in the free state. Most telluric ores are gold bearing, and the presence of this element is often looked on as an indication of gold.

In placer mining, when the alluvium is at the surface the exploration of the ground can proceed forthwith, and with pick and shovel the gravel is turned over and the nuggets taken out. The remainder is afterward washed to recover the finer particles of gold, in the pan, the dolly, or the cradle. When the 'pay dirt' is covered with soil, etc. the 'cover' is first removed to lay it bare, and the washing proceeded with. From the above references the presence of water is a most important item in the satisfactory exploiting of alluvium. The washing of sands and gravels is a simple matter. In washing in the pan—'panning out'—a quantity of the dirt free from the stones is put into a shallow iron or wooden dish some 15 inches in diameter, with a slight depression in the middle. It is then mixed with water, and the dish put with its edge just under water with one side a trifle lower than the other. Any lumps are broken up by hand. By a gentle whirling and jerking motion the sand and other light bodies are washed over the edge of the pan, and the heavy matters containing the gold remain at the bottom and accumulate in the central depression. Pebbles are thrown out, and the 'colors' (specks of gold) are then sought after and picked out, or the whole heavy residue saved, dried, and blown, or treated with a little mercury to extract the gold. The method of sluicing is adopted where practicable for treating alluvial deposits. The 'sluices' consist of troughs called 'flumes,' in sections about 12 feet long, mounted on trestles to give a sufficient inclination—from $\frac{3}{4}$ to $1\frac{1}{2}$ inch to the foot. The lower ends of the troughs fit into the upper ends of the succeeding sections. The bottom of the sluice box is crossed transversely by bars of wood or iron. In long sluices these are about two inches thick and are supported by longitudinal bars, dividing the bottom of the sluice into rectangular spaces. The gravel is placed at the top and washed down by a stream of water, while the lumps in the hand sluices are broken up by raking them.

In dealing with hard 'cements' and 'deep leads,' the material is generally first treated in a 'puddling' machine. In this the pay dirt is disintegrated by edge runners, or revolving rakes or harrows, or some other form of crushing or stirring apparatus, while a current of water carries the debris from the machine into the flumes and over the

strakes. Much of the coarse gold remains in the puddling machine

In placers where the ground is suitable these deep leads and other alluvial deposits are worked by washing down the gravel by means of a powerful jet of water, a head of 200 to 250 feet being sometimes employed. The jet is delivered from a movable pivoted nozzle—the 'monitor' or 'giant'—against the bank of auriferous material, and the detached debris washed into sluices where the gold is deposited. These sluices are larger than those already mentioned, being sometimes 5 to 6 feet in width, 2 to 3 feet deep, and are often paved with stone and provided with iron riffle bars. Some of them are upward of a mile long. Mercury is always fed in at the top, and the amalgam recovered by raising the riffle bars after turning off the water and cleaning out the gravel. An immense water supply is required for this purpose, and the water is often brought for miles in 'flumes' which cross gulches and valleys supported on trestles, and are carried in tunnels through hills. This method of working these deposits, known as the hydraulic method, is the cheapest.

In dealing with the material from veins or reefs of quartz and other hard substances containing free gold the stuff is reduced to fine powder and then passed, suspended in water over copper plates amalgamated with mercury, to which the gold adheres. The ore to be crushed is first put through a 'stone-breaker' or 'ore crusher'; and the broken ore passes to the ore bins, thence to the feeders and on to the stamps, or some form of grinding mill. The lower part of the battery consists of a cast-iron box—'mortar box'—fitted on one or both sides with a fine screen of wire-cloth or perforated sheet metal. At the bottom of this box is a row of iron blocks called 'dies,' on which the stamps fall. The stamps are heavy cylindrical cast-iron blocks—heads—to which are attached loose steel facing pieces—'shoes'—fixed to the lower ends of the vertical iron rods—stems—moving up and down between guides carried by the framing. The stamps are raised by cams keyed on the revolving shaft. As the shaft revolves the cam raises the stamp twice in each revolution and allows it to fall when the cam passes. The stamps are thus continually pounding the ore in the mortar box. The motive power may be steam-engines, turbines, or, in some cases, electricity. Mercury is fed into the mortar box in small quantities and much of the gold is retained there on amalgated copper plates. The 'tailings' which may still contain some gold receive further treatment. The stamp battery is often replaced by roller crushing machines, and grinding mills of various types, the objects of which are the same; and with certain ores these are even more effective. The 'tailings' are either ground with mercury for a prolonged period (old fashioned method), treated with chlorine gas (chlorination process) or with a cyanide solution (cyanide process). The last mentioned is especially valuable in treating 'tailings' heretofore left on the dumps.

The latest invention in gold-mining is known as the 'dry placer method,'—a device for separating gold from placer gravel without the use of water. The gravel after passing through a series of screens, is subjected to a powerful blast of air from a rotary blower. The heaviest metal falls directly to the bottom of the separator, but the blast throws the lighter gravel, black sand and iron into a separate compartment, leaving the gold alone and so nearly undefiled that any impurities may be removed by simple processes.

GOLDBEATER'S SKIN: delicate membrane prepared from the large intestine of the ox, and used as a dressing for slight wounds, as the fabric for court-plaster, etc., but chiefly by gold-beaters (see GOLD-BEATING, below). The outer or peritoneal membrane is used for this purpose. The intestine is first subjected to partial putrefaction, by which the adhesion of the membranes is sufficiently diminished to enable them to be separated; the separated membrane is then further cleaned from the adhering muscular fibres, dried, beaten, and pressed between paper, besides being treated with alum, isinglass, and white of egg, the object of which is to obtain the pure continuous membrane free from grease and impurities, without allowing the putrefactive processes to weaken it. A packet of 900 pieces of skin, each four inches square, is worth about $40. They may be beaten continuously for several months with a 12-lb. hammer without material injury. The intestines of 500 oxen are required to furnish the 900 leaves that form one packet, or *mold*, as it is technically called. The manufacture is extremely offensive. Chlorine has been introduced both as a disinfectant and to assist in the separation of the membrane.

GOLD'-BEAT'ING: process by which gold is extended to thin leaves used for gilding. The gold used for this purpose is usually alloyed with silver or copper, according to the color required (see GOLD). For *deep gold*, an alloy containing about 1 part of copper to 20 of pure gold is used. As gold-leaf is sold not by weight, but by superficial measure, and as increasing the quantity of alloy diminishes the malleability, there is little temptation to use the baser metals as adulteration.—The gold is first cast into oblong ingots about $\frac{3}{4}$ of an inch wide, weighing two ounces. The ingot is flattened out into a ribbon of about $\frac{1}{800}$ of an inch in thickness by passing it between polished steel rollers. This is annealed or softened by heat, and then cut into pieces of one inch square; 150 of these are placed between leaves of vellum, each piece of gold in the centre of a square vellum leaf, another placed above, and so on till the pile of 150 is formed. This pile is enclosed in a double parchment case, and beaten with a 16-lb. hammer. The elasticity of the packet considerably lightens the labor of beating, by causing the hammer to rebound with each blow. The beating is continued until the inch-pieces are spread out to four-inch squares; they are then taken out, and cut into four pieces, and squares

thus produced are now placed between *gold-beater's* skin instead of vellum, made into piles, and enclosed in a parchment case, and beaten as before, but with a lighter hammer. Another quartering and beating produces 2,400 leaves, having an area of about 190 times that of the ribbon, or a thickness of about $\frac{1}{200000}$ of an inch. An ounce of gold is thus extended to a surface of about 100 sq. ft.

GOLD COAST COLONY: A British crown colony on the west coast of Africa, bounded on the e. by the German colony of Togoland and on the w. and n. by the French colonies of the Ivory Coast, and the French Soudan. A protectorate extends inland to an average distance of 440 miles. The first English company to trade with the Gold Coast was chartered in 1662. In 1821 the settlements were transferred to the crown as a part of Sierra Leone, and in 1874 were separated as the Gold Coast Colony. The native state of Ashanti is now part of the colony. The whole country is very rich as regards minerals and agriculture. Area, about 120,000 sq. m. Pop. between 2 and 3 millions (2,000 Europeans).

GOLD-CURE, n. *gōld'kūr*: a treatment for the cure of drunkenness, the morphine and opium habits, etc., based largely on a hypodermic injection of a secret fluid popularly believed to contain gold. This system of treatment was invented by Leslie E. Keeley. The craving for alcohol seems to be abated by the method in many cases, but doubt exists as to the permanency of the cure. The treatment is not so popular now as it once was.

GOLD'EN AGE: fabled age of primitive simplicity and happiness. In the mythologies of most peoples and religions, there exists a tradition of a better time, when the earth was the common property of man, and produced spontaneously all things necessary for an enjoyable existence. The land flowed with milk and honey, beasts of prey lived peaceably with other animals, and man had not yet by selfishness, pride, and other vices and passions, fallen from a state of innocence. At the foundation of this legend lies the deep-rooted opinion, that the world has degenerated with the progress of civilization, and that mankind, while leading a simple, patriarchal life, were happier than at present. The Greeks and Romans placed this golden age under the rule of Saturn; and many of their poets—e.g., Hesiod, in his *Works and Days*, Aratus, Ovid, and, above all, Virgil, in the first books of the *Georgics*—have turned this poetic *matériel* to admirable account, and defined the gradual decadence of the world, as the silver, the brass, and the iron ages, holding out the hope that the age of gold will one day return.

GOLD'EN BEE'TLE: popular name for many of a genus of coleopterous insects, *Chrysomela*, and of a tribe or family, *Chrysomelinæ* or *Chrysomelidæ*, belonging to the tetramerous section of the order. The body is generally short and convex, the antennæ are simple and wide apart at the base; some of the species are without wings. None

are large. The finest species are tropical, but some are found in temperate regions. Some of them, in the larva state, commit ravages in the field and garden.

GOLD'EN BULL [Lat. *Bulla Aurea*, Ger. *Goldene Bulle;* named from the gold case in which the seal attached to it was inclosed]: imperial edict in German history issued by Emperor Charles IV., mainly for the purpose of settling the law of imperial elections. Till that time much uncertainty had prevailed as to the rights of the electoral body, claims having frequently been made by several members of the lay electoral families, and divisions having repeatedly arisen from this uncertainty; the effect of such divisions being to throw the decision for the most part into the hands of the pope. To obviate these inconveniences, the G. B. defines that one member only of each electoral house shall have a vote—viz., the representative of that house in right of primogeniture, and in case of his being a minor, the eldest of his uncles paternal. On the great question as to the dependence of the imperial office on the pope, and as to the right of the pope to examine and approve the imperial election, the G. B. is silent, though it declares the emperor competent to exercise jurisdiction in Germany from the moment of election. It invests the vicariate together with the government of the empire during the interregnum, in the Elector Palatine, and the Elector of Saxony; but it is remarkable that this applies to Germany only. On the vicariate of Italy, which was claimed by the popes, nothing is said. The G. B. contains also some provisions restraining the so-called *Faustrecht* (literally, 'fist-law'), or right of private redress. It was solemnly enacted in two successive diets at Nürnberg and Metz, 1356, and original copies were furnished to each of the electors, and to the city of Frankfurt. The electoral constitution, as settled by this bull, was maintained almost unaltered till the extinction of the empire.

In Hungarian history, the G. B. is a constitutional edict, issued by Andrew II. in the early part of the 13th c. It changed the government of Hungary from an absolutism to an aristocratic monarchy, and it contained till recent times the charter of the liberties of Hungary, or perhaps of the noble class. See Schmidt's *Geschichte der Deutschen,* III. 338.

GOLD'EN-CREST'ED WREN (*Regulus aurocapillus*): very beautiful bird of the family *Sylviadæ*, smallest of British birds: some species are found in N. America and Asia. Its entire length is scarcely three inches and a half. Notwithstanding its name, it is not really a wren, but this name continues in popular use rather than *Regulus* and *Kinglet*, which have been proposed instead. The golden-crested wren is greenish-yellow on the upper parts, cheeks and throat grayish white; crown feathers elongated, and forming a bright yellow crest. In its habits, it is intermediate between the warblers and the tits. It particularly affects fir-woods. In 1822, Oct., thousands were driven on the British coast of Northumberland and Durham by a

severe n.e. gale. The nest of this bird is suspended from the outermost twigs of a branch of fir, some of them being interwoven with it.

GOLD'EN-EYE: species of Duck: see GARROT.

GOLD'EN-EYE FLY (*Hemerobius perla*, or *Chrysopa perla*): neuropterous insect; pale green, with long thread-like antennæ, long gauze-like wings, and brilliant golden eyes. Its flight is feeble. The length, from the tip of the antennæ to the tip of the wings, is almost an inch and a half, but the insect without wings and antennæ is not above one-third of this length. The female attaches her eggs, in groups of 12 or 16, by long hair-like stalks, to

Golden-eye Fly (*Chrysopa perla*)
(Copied from Morton's *Encyclopædia of Agriculture*):
a, cocoon; *b*, the same magnified; *c*, larvæ; *d*, the same magnified, and freed from adhering substances; *e*, perfect insect, on a branch to which its eggs are attached.

leaves or twigs: the eggs have been mistaken for fungi. The larvæ are ferocious-looking little creatures, rough with long hairs, to which particles of lichen or bark become attached; they are called *aphis-lions*, and are very useful by the destruction of aphides, on which they feed. The pupa is inclosed in a white silken cocoon, from which the fly is liberated by a lid.

GOLD'EN FLEECE: in Greek tradition, fleece of the ram Chrysomallus, the recovery of which was the object of the Argonautic expedition: see ARGONAUTS. The G. F. has given its name to a celebrated order of knighthood in Austria and Spain, founded by Philip III., Duke of Burgundy and the Netherlands, at Bruges, 1429, Jan 10, on the occasion of his marriage with Isabella, daughter of King John I of Portugal. This order was instituted for the protection of the church, and the fleece was probably assumed for its emblem, as much from being the material of the staple manufacture of the Low Countries, as from its connection with heroic times. The founder made himself grand-master of the order, a dignity appointed to descend to his successors; and the number of knights, as first limited to 24, was subsequently increased. After the death of Charles V., the Burgundo-Spanish line of the

House of Austria remained in possession of the order; but at the close of the Spanish war of succession, the emperor, Charles VI., laid claim to it in virtue of his possession of the Netherlands, and taking with him the archives of the order, celebrated its inauguration with great magnificence at Vienna 1713. Philip V. of Spain contested the claim of Charles; and the dispute, several times renewed, was at last tacitly adjusted by the introduction of the order in both countries. The insignia are a G. F. hanging from a gold and blue enamelled flintstone emitting flames, and borne in its turn by a ray of fire. On the enamelled obverse is inscribed *Pretium laborum non vile.* The decoration was originally suspended from a chain of alternate firestones and rays, for which Charles V. allowed a red ribbon to be substituted, and the chain is now worn only by the grand-master. The Spanish decoration differs slightly from the Austrian. The costume consists of a long robe of deep red velvet, lined with white taffetas, and a long mantle of purple velvet lined with white satin, and richly trimmed with embroidery containing firestones and steels emitting flames and sparks. On the hem of white satin is embroidered in gold, *Je l'ay empris.* There is also a cap of purple velvet embroidered in gold, with a hood, and the shoes and stockings are red. In Austria, the emperor may now create any number of knights of the G. F. from the old nobility; if Protestants, the pope's consent is required. In Spain, none but princes and grandees, and personages of peculiar merit are eligible.

GOLD'EN HORDE: Tartar force, led first by the grandson of Ghengis Khan, which invaded Russia, captured Moscow and Kiev, and destroyed other cities. A Magyar army which met them 1241 was defeated and massacred.

GOLD'EN LEG'END (Lat. *Aurea Legenda*): celebrated collection of hagiology, which for a time had almost unequalled popularity, having passed through more than a hundred editions, and translations into almost all European languages. It is the work of James de Voragine, also written 'Vragine' and 'Varagine,' b. abt. 1230. He entered the Dominican order, and was elected, at a comparatively early age, provincial of the order in Lombardy 1267. Toward the end of that century, he was elected Abp. of Genoa; and by his ability, moderation, and exemplary life, he had great influence in the public affairs of his time, being called more than once into the councils of the popes themselves, in affairs of difficulty. The *Legenda* consists of 177 sections, each devoted to a particular saint or festival, selected according to the order of the calendar. In its execution, the work, as may be supposed from its age, is far from critical, but is deserving of study as a literary monument and as illustrating the religious habits and views of the Christians of that time. It presents a very different phase of the mediæval mind from that exhibited in the acute and severely philosophical lucubrations of the schools. A translation of the G. L. was made by William Caxton, for the Earl of Arundel, published 1483.

GOLD'EN NUM'BER for Any Year: the number of that year in the Metonic Cycle (q.v.), and as this cycle embraces 19 years, the golden numbers range from 1 to 19. The cycle of Meton came into general use soon after its discovery, and the number of each year in the Metonic cycle was ordered to be engraved in letters of gold on pillars of marble, hence the origin of the name. Since the introduction of the Gregorian calendar, the point from which the golden numbers are reckoned is B.C. 1, as in that year the new moon fell on Jan. 1; and as by Meton's law the new moon falls on the same date (Jan. 1) every 19th year from that time, we obtain the following rule for finding the G. N. for any particular year. '*Add 1 to the number of years, and divide by 19; the quotient gives the number of cycles and the remainder gives the golden number for that year; and if there be no remainder, then 19 is the golden number, and that year is the last of the cycle.*' The golden number is used for determining the Epact (q.v.) and the time for observing Easter (q. v.).

GOLD'EN-ROD (*Solidago*): genus of plants of nat. ord. *Compositæ*, sub-ord. *Corymbiferæ*, closely allied to *Aster*, but distinguished by the single-rowed pappus and tapering —not compressed—fruit. The species are natives chiefly of temperate climates, and are most numerous in N. America: a few are European. These plants have erect panicled crowded racemes of small yellow flowers, and are a charming ornament of fields and pastures in the later summer. They are of favorite use in decoration, and were they not so abundant, would be grown in gardens. Some species of golden-rod had formerly great reputation as a vulnerary, whence the name Solidago, it is said, from Lat. *solidare*, to unite. The leaves of a fragrant N. America species, *S. odora*, have been used as a substitute for tea. They are mildly astringent and tonic.

GOLD'EN ROSE: rose formed of wrought gold, set with gems, blessed with much solemnity by the pope in person on Mid-lent Sunday (4th Sunday in Lent, or 'Lætare Sunday'). The prayer of blessing contains a mystic allusion to our Lord as 'the flower of the field and the lily of the valleys.' The Golden Rose is anointed with balsam, fumigated with incense, sprinkled with musk, and is then left on the altar until the conclusion of the mass. Formerly, in the solemn papal procession of the day, the pope carried it in his hand. It is usually presented, with an appropriate form of words, to some Rom. Cath. prince whom the pope desires especially to honor. The origin of the ceremony is uncertain, but the probable opinion as to its date is that of Martêne and Du Cange, who fix it in the pontificate of Innocent IV. See Wetser's *Kirchen Lexicon*, IX. 397.

GOLDEN SECTION: primarily a mathematical term referring to a division of a magnitude into two parts such that the smaller part bears to the larger the same ratio as the larger does to the whole. The ratio (1.618+) is an incommensurable one. The term has acquired

an importance because it has been utilized in a theory of æsthetics. Such a division of a line is agreeable but not always the most agreeable. Parallelograms whose sides bear this ratio to each other are æsthetically agreeable. The principle has been applied to musical harmony, it being assumed that the harmony of tones is proportional to the degree in which their vibration rates approximate this ratio. The facts do not bear out the assumption.

GOLDEN SECTION, in Geometry: the EXTREME AND MEAN RATIO.

GOLD-EYE (*Hyodon*): genus of malacopterous fishes, inhabiting the lakes and rivers of N. America; the type of a family *Hyodontidæ*, of which other members are found in tropical America and in Borneo. They are small fishes, much compressed like herrings, feed like trout on insects, and like trout are often taken by anglers with artificial flies. They have the mouth abundantly armed with teeth, having teeth far back on the palate as well as on the tongue and jaws.

GOLD'FINCH (*Fringilla carduelis* of Linnæus, or *Carduelis elegans*): pretty little bird of the family *Fringillidæ*, favorite cage-bird for its soft and pleasing song, its intelligence, its liveliness, and the attachment which it forms for those who feed and caress it. The genus *Carduelis* is distinguished by a thick conical bill, without any bulging, attenuated and very sharp at the tip. Some writers distinguish two groups; one the goldfinch, whose British and American species are very similar; the other, with darker plumage and shorter bill, represented by the Aberdevine (q.v.), or Siskin; but other writers do not consider the latter group in such close alliance to the former. The goldfinch is about five inches in entire length; black, blood-red, yellow, and white are beautifully mingled in its plumage. The colors of the female are duller than those of the male. It is widely diffused throughout Europe, and is found in parts of Asia. It is a common bird in Britain and America, but somewhat local. It is seen in small flocks on open grounds, feeding on the seeds of thistles and other plants, and in the earlier parts of the season frequents gardens and orchards. Its nest is made in a tree, bush, or hedge, is remarkable for extreme neatness, and is always lined with the finest downy material that can be procured. The eggs are four or five in number, bluish-white, with a few spots and lines of pale purple and brown. The goldfinch is much employed by bird-catchers as a call-bird. It can be trained to the performance of many little tricks, of which the trainers seem to prefer the raising of water for itself as from a well in a bucket the size of a thimble. The AMERICAN GOLDFINCH (*F.* or *C. tristis*) has very similar habits and song, and the same interesting liveliness and affectionateness in domestication: the nest is of the same elegant structure. It is a common bird in most parts of North America.

GOLD'FISH, or Gol'den Carp (*Cyprinus auratus*): fish of the same genus with the carp, native of China, now domesticated and naturalized in many parts of the world. It is said to have been originally confined to a lake near the mountain Tsien-king, in the province of The-kiang, in China; but this is questionable. It has been long common in many of the fresh waters of China, and was introduced into England about the end of the 17th or beginning of the 18th c. On account of the brilliancy of its colors and the ease with which it is kept in glass globes or other vessels, in apartments, it soon became, and has continued to be, a general favorite. Its ordinary length is five or six inches, but it has been known to reach 12 inches. When young, it is of blackish color, but acquires its characteristic golden red as it advances to maturity, some individuals (*Silver-fish*) becoming rather of a silvery hue. Monstrosities of various kinds are frequent, particularly in the fins and eyes. The goldfish is now plentiful in some streams of s. Europe from which it is exported into countries northward, where also it breeds in ponds, particularly in those into which hot water is poured from steam-engines, which sometimes swarm with its fry. In confinement, it may be fed with worms, insects, crumbs of bread, yelks of eggs dried and powdered, etc. Frequent changing of the water is advantageous, not only because of its being more fresh and better aërated, but because of the animalcules thus supplied for food.

GOLD HILL: a former town of Nev.; on the Va. and Truckee railroad; at the head of Gold Cañon; on the Washoe range of the Sierra Nevada Mts.; 7,000 ft. above the sea; now a part of Virginia City. It received its name from its location on a part of the famous Comstock Lode, and beneath it are some of the richest gold and silver mines in the world. These have been worked to a depth of 2,000 ft., and yield in bullion of both metals about $2,000,000 per month. The chief mines are the renowned Belcher and Crown Point, with the Gould and Curry ranking second in importance. The part contains 12 quartz mills, 4 churches, a bank, and a daily newspaper, and receives its water supply from the summit of the Sierra Nevada. Pop. 4,800.

fabric formed by weaving silken threads previously gilded. The peculiarity of this manufacture consists in the gilding of the silk in such manner that it shall retain flexibility for weaving. A deep yellow or orange colored silk is used. The usual method is by 'fibre-plating.' A rod of silver is gilded by simply pressing and burnishing leaves of gold upon it. This gilded silver is then drawn into very fine wire, so fine that one ounce of metal can be extended to the length of more than a mile. It is then flattened between polished steel rollers, and further extended so that a mile and a quarter weighs only one ounce; for the last drawing, the wire is passed through ruby dies. The film of gold upon this flattened wire is much thinner than beaten gold-leaf, and has frequently been quoted as an instance of the divisibility of matter, as one inch of the highly gilded wire contains but the eighty-millionth part of an ounce of gold, or $\frac{1}{100}$ of an inch, which is a visible quantity exhibiting the color and lustre of gold, contains but $\frac{1}{80000000}$ of an ounce, or one ounce of gold covers more than 100 m. of wire. This flattened gilded wire is then wound over the silk, so as to inclose it completely, and produce an apparently golden thread. Other means of directly gilding the thread have been tried, and for some purposes are successful, but none yet discovered give the thread the same degree of lustre as this, which was first practiced in a ruder manner by the Hindus. Hock's method of fibre gilding is to pass the silk through a mucilaginous solution and then receive it on a brass cylinder, over which it is closely rolled. Gold-leaf is then laid upon this coil of gummed silk, and thus one side is coated: the other side is gilded by rolling it from the first to a second cylinder in the opposite direction, thus the plain side falls outermost, and is then coated with gold-leaf like the other. This is rather cheaper than the fibre plated silk, and more flexible, but not so brilliant.

GOLDMARK, Karl: an Austro-Hungarian composer; b. of Jewish parentage in Keszthely, Hungary, 1832, May 18; settled in Vienna, where he wrote many of his compositions. His best features are very skilful management of orchestral music and picturesque originality. He became popular in the United States through his operas *Merlin* and *The Queen of Sheba*, which were produced in 1887, for the first time on any stage, in the Metropolitan Opera House, New York city; and also by his overtures *Penthesilea* and *Sakuntala*. His symphony *The Country Wedding*, proved a great success.

GOLD OF PLEAS'URE (*Camelina*): genus of plants of the .nat. ord. *Cruciferæ*, having an erect calyx, small bright yellow flowers, and inflated pear-shaped or wedge-shaped pouches. The species are few. The common Gold of Pleasure (*C. sativa*), (Fr. *Cameline*, Germ. *Dotter*) is an annual plant 1½—3 ft. high, with terminal racemes and pear-shaped pouches; the leaves smooth, bright green, entire or slightly toothed, the middle stem-leaves arrow-shaped and embracing the stem. Notwithstanding its high-sounding English name, the plant is of humble and plain appearance. It grows in fields and waste places in Europe and n. Asia. In many parts of Germany, Belgium, and s. Europe, it is extensively cultivated for the abundant oil in its seeds. The seeds and the oil-cake made from them are used also for feeding cattle, though inferior to linseed, and to the oil-cake obtained from linseed. The oil, though sweet and pure at first, is very liable to become rancid, and is less valued than that of rape-seed or colza: the seeds of Gold of Pleasure are often mixed with rape-seed for the production of oil. The value of the plant in agriculture depends much on its adaptation to poor sandy soils, though it prefers those of better quality; and on the briefness of its period of vegetation, as it may be sown after another crop has failed, or be plowed down as a green manure.

GOLDONI, *gol-dō'nē*, Carlo: 1707—1793, Feb. 6; b. Venice: most celebrated writer of comedy among the Italians. He received his first education at Rome. His father intended him for an actor, and fitted up a private theatre for his diversion at home, but the boy showed no aptitude for histrionic performances, and was sent to Pavia to study for the priesthood. Goldoni, however, was still less fitted for an ecclesiastic than an actor, and was expelled from the college for writing scurrilous satires. In 1731, after his father's death, he was received as advocate; but finding the legal profession not lucrative, he relinquished it, and began composing comic almanacs, which became highly popular. Several of his minor comedies were represented about this time, and attracted much public favor by novelty as well as merit. In 1736 he married

the daughter of a notary of Genoa, and subsequently went to Bologna, where, through an introduction to Prince Lobkowitz, he was entrusted with the composition of an ode in honor of Maria Theresa, and with the organization of the theatrical entertainments of the Austrian army. Later, he was at Florence, working assiduously at comedies. On his return to Venice he made very lucrative arrangements with the manager of the theatre of St. Luke, and after a visit to Rome passed into France, and was appointed Italian master to the royal children, which situation allowed him to apply himself tranquilly to his literary occupations. In Paris he produced one of his most admired comedies, in French, entitled *Le Bourru bienfaisant* (The Benevolent Grumbler). It excited universal admiration, and drew forth a most eulogistic criticism from the pen of Voltaire. On the breaking out of the Revolution, Goldoni lost his pension, and died shortly before its restoration by decree of the convention. Goldoni has left 150 comedies of unequal merit. The larger part are inimitable representations of the events of daily life, under both their simplest and most complex aspects. Goldoni's compositions show as aim—the advancement of honorable sentiments, and the flagellation of prevailing vices and follies.

GOLDS'BORO, N. C., city, county-seat of Wayne County; on the Neuse River, the Atlantic & N. C., the Southern, and the Atlantic C. L. R.R.'s; about 80 m. north of Wilmington, and 50 s.e. of Raleigh. It is the site of a State Normal School for colored teachers, the Eastern Insane Asylum, and the Odd Fellows' Orphanage. The chief manufactures are cotton, agricultural implements, cotton-seed oil, furniture, mattresses, and machinery. Pop. (1910) 6,107.

GOLDSBOROUGH, *gōlz'bŭr-rĕh*, Louis Malesherbes, U.S.N.: 1805, Feb. 18—1877, Feb. 20; b. Washington, D. C. His father, Charles Washington Goldsborough, was chief clerk in the navy dept. 1798—1812, and procured a midshipman's appointment for him when only 7 years old, 1812, June 18, according to an old English custom long observed in the U. S. navy. He was commissioned lieut. 1825, promoted commander 1841, capt. 1855, rear-admiral 1862, and retired 1873. In 1827, with 40 men he recovered the English brig *Comet* from a force of 200 Greek pirates in the Doro Passage. In 1861, he was appointed commander-in-chief of the n. Atlantic blockading squadron, planned and executed the joint army and naval expedition to the Sounds of N. C., known as the Burnside (q.v.) expedition, which captured Roanoke Island 1862, Feb. 5. He commanded the European squadron 1865, and the Mare Island navy yard, Cal., 1868, and at the time of his retirement had been longer in the service and seen more active duty than any other naval officer then living.

GOLDSCHMIDT, *gōlt'shmĭt*, HERMANN: 1802, June 17—1866, Sep. 11; b. Frankfort, Germany: astronomer. He studied painting with Cornelius and Schuorr in Munich, opened a studio in Paris 1836, and painted with success till 1847, when he turned his attention to astronomy. As a painter he produced the *Cumœan Sibyl* (1844), *Offering to Venus* (1845), *View of Rome* (1849), *Death of Romeo and Juliet* (1857), and a number of Alpine landscapes. As an astronomer he discovered 14 asteroids between Mars and Jupiter (1852—61), for which he received the grand astronomical prize of the Acad. of Sciences. He discovered also a large number of stars not previously indicated on atlases, and several new ones near Sirius.

GOLDSCHMIDT, JENNY LIND (Madame Otto Goldschmidt): celebrated Swedish singer, 1821, Oct. 6—1887, Nov.; b. Stockholm. She was of humble parentage, and her musical gifts were noticed first by an actress, by whose influence she was admitted, at the age of nine, into the Conservatory of Stockholm, where she received lessons of Crœlius and Berg. She sang before the court with success, and at the age of 16 appeared in the *rôle* of Agatha, in *Der Freischütz*. Four years later, she went to Paris, to receive lessons from Garcia. Her voice was now thought wanting in volume, and when she appeared at the Grand Opera two years later, her failure was so mortifying that she is said to have resolved never again to sing in France. Returning to Stockholm, she was heard with enthusiasm in *Robert le Diable*, and at the instance of Meyerbeer was engaged at Berlin 1845. After singing two years in Prussia, she visited Vienna, and other German cities, and made her *debut* in London 1847, with very marked success. Her return to Stockholm was greeted with an ovation, and the tickets to the opera in which she appeared were sold at auction. She returned to London 1849, and won an immense triumph. The royal family and court were present at nearly every representation, and the receipts were often over £2,000. The London season was followed by a concert tour in the provinces, with a similar success, and her great popularity was increased by the distribution of a large part of her receipts in charities. In 1850, she made an engagement with Mr. P. T. Barnum of New York for a concert tour in America, extending through the United States, British provinces, Mexico, and the W. Indies. The receipts of this well-managed tour were $610,000, of which Mademoiselle Lind received $302.000. While in America, she was married to Otto Goldschmidt, native of Hamburg, who accompanied her as pianist. They returned to Europe 1852, and resided at Dresden after she had visited Stockholm, and expended $200,000 in endowing schools in her native country. After that time Madame Goldschmidt rarely sang at concerts. In 1874, her husband

and she taught music at Wiesbaden; in 1883, Madame Goldschmidt consented to teach singing at the English Royal College of Music. Her voice was a soprano of 2½ octaves, remarkable for sweetness, purity, and sympathetic tone.

GOLDSCHMIDT, Otto, English composer: b. Hamburg, Germany, 1829, Aug. 21. He was a pupil of Mendelssohn and Hauptmann at the Leipsic Conservatory, became a resident of England in 1858, was appointed a professor in the Royal Academy of Music in 1863 and its vice-principal in 1866. From 1876-85 he was first musical director of the Bach Choir. His compositions include the oratorio *Ruth* (1867), and he also edited with Sterndale Bennett *The Chorale Book for England.* In 1852 he married Jenny Lind.

GOLD'SINNY, or Gold'finny [from their prevalent yellow color]: certain small species of *Crenilabrus,* genus of fishes of the Wrasse family (*Labridæ*). They are plentiful on the coasts of n. Europe. They frequent rocky shores, and are sometimes taken by anglers from the rocks. Like the wrasses, they have a very elongated dorsal fin.

GOLDSMITH, *gōld'smĭth,* Oliver: 1728, Nov. 10—1774, Apr. 4; b. in the village of Pallas, county of Longford, Ireland. His father, the Rev. Charles Goldsmith, clergyman of the Established Church, held the living of Kilkenny West. At the age of six, Goldsmith was placed under the care of the village schoolmaster, when an attack of small-pox interrupted his studies. On his recovery, he attended school at various places. 1745, June 11, he entered Trinity College, Dublin, as a sizar; the expense of his education being defrayed by his uncle, the Rev. Thomas Contarine. At the university—where Burke was his contemporary—Goldsmith gave no evidence of the possession of talent; and becoming involved in some irregularity he quitted his studies in disgust. He lingered in Dublin till his funds were exhausted, then wandered on to Cork, where, he being in great distress, a handful of peas was given him by a girl at a wake, the flavor of which remained always sweet in his memory. By his brother Henry he was brought back to college, where, 1749, Feb. 27, he received the degree of B.A. His uncle was now anxious that his nephew should enter the clerical profession; but when he appeared before the bishop, he was rejected. His kind-hearted relative then gave him £50, and sent him to Dublin to study law; but Goldsmith being attracted to a gaming-table, risked his entire capital, and of course lost it. Another sum was then raised, and he went to Edinburgh to study medicine, where he remained 18 months, but did not take a degree. He then went to the continent, hovered about Leyden for some time, haunting the gaming-tables with small success; and in 1755, Feb., he left that city to travel on foot through Europe, scantily provided

as to purse and wardrobe, but rich in his kindly nature and his wonder-working flute.

After taking his degree of B.M. at Padua or Louvain, Goldsmith returned to England, 1756, Feb., when, by the assistance of Dr. Sleigh, a fellow student, he set up as a physician among the poor. He did not succeed in his profession, and he is represented as having become usher in the academy of Dr. Milner at Peckham. During this period he supported himself by contributions to the *Monthly Review*. He became a candidate for a medical appointment at Coromandel, but was rejected by the College of Surgeons. The clothes in which he appeared for examination had been procured on the security of Mr. Griffiths, editor of the *Monthly Review;* and as Goldsmith, urged by sharp distress, had pawned them, his publisher threatened him with the terrors of jail. He had now reached the lowest depths of misery; but the dawn was about to break.

His first publication of note was an *Inquiry into the Present State of Polite Learning in Europe,* published 1759, Apr., a work of small value. 1760, Jan., Mr. Newbery commenced the *Public Ledger,* to which Goldsmith contributed the celebrated *Chinese Letters,* afterward republished under the title *The Citizen of the World.* He also wrote a *Life of Beau Nash,* and a superficial *History of England,* in a series of letters. 1761, May 31, he was introduced by Dr. Percy to Dr. Johnson, who, in turn, introduced his new friend to the Literary Club. In 1764, Dec., *The Traveller* appeared, and at once placed him in the front rank of English authors. Two years after this he published the *Vicar of Wakefield,* which has now charmed four generations. In rapid succession he produced his other works. The comedy of the *Good Natured Man,* 1767; *Roman History,* 1768; and *The Deserted Village*—sweetest of all his poems—1770. In 1773, his comedy of *She Stoops to Conquer* was produced at Covent Garden with great applause. His other works are—*Grecian History,* 1774; *Retaliation,* a poem, 1777; and *History of Animated Nature,* which he did not live to complete. Although now in receipt of large sums for his works, Goldsmith had not escaped from pecuniary embarrassment. He was extravagant, loved fine living and rich clothes, his charities were bounded only by his purse, and he haunted the gaming-table quite as frequently, and with as constant ill success as of old. In 1774, March, he came up to London, ill in body and harassed in mind, and took to bed on the 25th. With characteristic wilfulness and imprudence, he, contrary to the advice of his medical advisers, persisted in the use of James's Powder. He became rapidly worse, and Dr. Turton said: 'Your pulse is in greater disorder than it should be from the degree of fever you have. Is your mind at ease?' 'No, it is not,' was the poet's reply, and the last words he uttered. He died £2,000 in debt, and more sincerely lamented than any literary man of his

time. Old and infirm people sobbed on the stairs of his apartments, Johnson and Burke grieved, and Reynolds, when he heard the news, laid down his pencil, and left his studio. He was buried in Temple Church, and a monument was erected to him in Westminster Abbey, bearing an epitaph by Dr. Johnson.

Goldsmith was the most natural genius of his time. He did not possess Johnson's mass of intellect, nor Burke's passion and general force, and he was without accurate knowledge; but he wrote the finest poem, the most exquisite novel, and—with the exception perhaps of the *School for Scandal*—the most delightful comedy of the period. Blundering, impulsive, vain, and extravagant, clumsy in manner and undignified in presence, he was laughed at and ridiculed by his contemporaries; but with pen in hand, and in the solitude of his chamber, he was a match for any of them, and took the finest and kindliest revenges. Nothing could be more natural, simple and graceful than his style, in which lay his strength. It is full of exquisite expressions, and most cunning terms. Whatever he said, he said in the most graceful way. When he wrote nonsense, he wrote it so exquisitely that it is better often than other people's sense. Johnson who, though he laughed at, yet loved and understood him, criticised him admirably in the remark: 'He is now writing a natural history, and will make it as agreeable as a Persian tale.' Goldsmith's life has been written by Prior (1837); Forster (1848–71); Washington Irving (1844–9); William Black, *English Men of Letters* (1878); and Austin Dobson, *Great Writers* (1888, revised American edition, 1899). His 'miscellaneous works' were first published in four volumes (1801), with the so-called *Percy Memoir*. Then, in 1820, came a 'trade edition,' followed by Prior (1837), and Cunningham (1854–5). The fullest modern edition is that of Gibbs *Bohn's Standard Library* (5 vols., 1885–6). There are editions of the poems by Mitford *Aldine Series* (1831–95); Bolton Corney (1845), and in the *Temple Library* (1889). Consult also Boswell's *Johnson;* Macaulay, *Encyclopædia Britannica;* Thackeray's *English Humorists*, and *Edinburgh Review*, 1846, by Lord Lytton.

GOLDSMITH BEETLE, an attractive northern dung-beetle (family *Scarabaeidæ*) measuring nearly an inch in length and shining like burnished gold. It is most abundant during May and June, flying principally at night and feeds on the foliage of various shade and fruit trees.

GOLDTHREAD, a low smooth ranunculaceous herb (*Coptis trifolia*), closely related to hellebore, whose evergreen leaves are all basal, long-petioled, and divided into three serrate broadly obovate parts; and the flowers small and white on scapes. The root consists of long, bright, yellow bitter threads. This plant contains a white alkaloid called coptine, and a tea made of it is tonic. See also COPTIS.

GOLDYLOCKS, n. *gōl'dĭ-lŏks* [*gold*, and *locks*]: a native plant, so called from the tufts of yellow flowers which terminate the stems; a familiar name of various species of plants, as *Helĭchrysum*, *Stœchas*, *Ranun'culus aurĭc'ŏmŭs*, and for the genus *Chrysŏcōmă*.

GOLF, or GOFF, n. *gŏlf*, or *gŏff* [Gael. *colbh;* Ger. *kolbe;* Sw. *kolf*, a club; Icel. *kólf*, a bulb; *kylfa*, a club]. Without doubt the game of golf originated in Scotland, where there are historical data, in abundance, to prove that it has been played for many centuries. A claim has been made that it originated in Holland, based mainly on its depiction on tiles and early engravings; but this only proves that in the pictile arts Holland was in advance of Scotland. That it was known amongst the fisherfolk of Holland is only natural, seeing that the Dutch fishermen followed the herring every year into Scottish waters, and fraternised with their brother fishermen in the region where golf was the Scottish national game; that it was even a great favorite amongst the sea-faring folk of Holland is evidenced by the fact that when William Barentz set sail from Amsterdam in 1596, in his attempt to find a northeast passage to Asia via the Arctic seas, he took with him a set of golfing clubs so that his crew, when frozen in for the winter, might have that game, as a diversion, on the snow. It was imported into England by the officers who accompanied King James VI., of Scotland, when, on the death of Queen Elizabeth, he became King James I., of England. They established in 1608, on the outskirts of London, the earliest golf club: known then, and now, as 'The Blackheath Golf Club.' The next home of golf, outside of Scotland, was in India, where Scottish soldiers introduced it more than half a century ago. It was not until the seventies of the last century that the game made much progress into England and about the same period (1873) it crossed the Atlantic to Montreal, Canada. The first two clubs organized and incorporated in the United States, were respectively at St. Andrews by Yonkers, and Shinnecock, Southampton, Long Island, in 1888 and 1890. Since that period it has spread into every state; and there are now some 1500 golf clubs, most of them with clubhouses, as well as excellent courses. The rules under which the game is played are, with a few local and minor exceptions, those of the St. Andrews Club of Scotland. The governing body in the U. S. is the U. S. Golf Association, but there are many State, Interstate, and Local Associations and annual contests. The game is played in the open cross-country, over a course which varies in length from 1½ to 3 miles, more or less, to complete its circuit. At intervals, also varying in distance, spaces called greens are leveled and sodded; on each green is a small round hole 4¼ inches in diameter. The game is started by one player placing a small hard ball on the ground, at a defined spot called 'the Tee,' and striking it with one of his

clubs so that it will travel in the direction of the first green, in such a manner as he thinks will land it in the best position to enable him to make his next stroke. His opponent then drives his ball from the same Tee towards the same green. Then each follow their respective balls, and make alternate strokes, until each player has succeeded in rolling his ball into the little hole on the green. He who does this with the fewest strokes wins the hole. Each of the other holes is then played, in a similar way, all round the course. The skill of the game is in avoiding the natural obstructions which intervene, such as trees, ponds, ditches, walls, fences, roads, the sides of hills, depressions in valleys, etc. Where there are not a sufficient number of these provided by nature, artificial ones are introduced in the form of raised sod-banks, sunken pits, and the like. The usual number of holes is either 9 or 18. The clubs used are a matter of personal predilection. There is no limit placed on them, either in shape, length, or weight. The usual ones are (1) the driver, mostly used on the play of the first stroke from each Tee. (2) The brassey, mostly used for the second stroke. (3) The cleek, which is an alternative to the brassey. (4) The mid-iron for shorter distances on approaching the green. (5) The mashie, for lifting the ball over intervening obstructions. (6) The putter, used on the green, for putting the ball, so that it rolls into the hole. A very diversified number of players can participate: but always in 'sides.' It may be one player against another, or two against two, or two against one: or the sides may consist of any equal number playing in couples, such as six couples, or more or less, from one club or city, playing against an equal number of opponents; or, at a tournament open to all entrants, a hundred or more may enter. In that case each entrant plays a preliminary round, and only the 16 or 32 who make the lowest scores continue in the contest. In such a tournament the preliminary round is at what is known as 'medal play:' *i. e.*, the score is that of the number of strokes which the player takes in impelling his ball completely round the course. The play between those who then remain in the game, is determined by each man drawing lots as to whom he shall be first matched against. Each couple so drawn play round the course, in what is known as 'match play:' *i. e.*, the tally is not the aggregate number of strokes taken to complete the course, but the number of holes won. Say, after the preliminary weeding 16 were left, then the first match round would result in 8 winners. The next round the 8 would be reduced to 4: and in the last round there would be but 2, who would play it out to the victory of one. Handicapping is an important feature in golf tournaments: the poorer players being allowed to deduct from their actual scores as many strokes, or holes, as a previous rating, by their committee, thought equitable: or the same result is achieved

by penalising a high-class player, by adding so many strokes to the score he actually makes. There are many other elaborate handicappings, and diversities of the game, such as 'best ball,' 'par,' 'three-somes,' 'four-somes,' 'four-ball game,' etc., which it is unnecessary to set out in detail.

GOLFO DULCE, *gŏl'fō dôl'sā* or *-thā* [Spanish, *Sweet* or *Fresh Gulf*: body of water on the coast, in the state of Guatemala, Central America, measuring 26 m. by 11, and having an average depth of 6 or 8 fathoms. It communicates with the outer sea, here known as the Gulf of Honduras, by a narrow strait called the Rio Dulce.

GOLGOTHA, n. *gŏl'gŏth-ă* [Heb. a skull: the place where our Lord was crucified—so named probably because it was a hillock or mound, bald and skull-like, or with a skull-shaped rock protruding. The Latin equivalent is Calvaria, 'a bare skull.' This place was outside the gates of Jerusalem, e. of the city, though the common opinion, a tradition from the middle ages, fixes it in the n. w. (See CALVARY.) It was probably the ordinary spot of execution, though this is to be inferred rather from the fact that, in the eyes of the Roman officers of justice, Christ was simply a common criminal, than from any supposed connection between the word 'skull' and a place of execution. A church was built over the spot in the 4th c. by Constantine. What is *now* called the 'Church of the Holy Sepulchre' to *the northwest* of Jerusalem, but within the walls of the city, has manifestly no claim whatever to be considered the building erected by Constantine; but while recent biblical scholars and travellers generally have assumed that the scene of our Savior's crucifixion and sepulture is not ascertainable, a writer in Smith's *Dictionary of the Bible* offers strong reasons for believing that the present mosque of Omar, called by the Mohammedans 'The Dome of the Rock,' occupies the site of the sacred Golgotha. One difficulty in tracing the spot, is in the fact that sieges, conflagrations, and re-buildings have greatly changed the ancient line of the city-wall.

GO'LIAD, Texas, city, county-seat of Goliad Co.; on the San Antonio River, and the Southern Pacific R.R., about 45 m. from the Gulf and 168 m. s.w. of Galveston. Goliad gets its name from Hidalgo (q.v.), the patriot priest of Dolores, who in 1810 led the revolution in Mexico against Spain. When Goliad was founded the people did not dare to name it Hidalgo, so dropping the silent H and transposing the letters, they made the word Goliad. This place was the last site of the ancient mission of La Bahia del Espiritu Santo (1749). This mission was first founded at the place where La Salle built Fort Saint Louis in 1685. Goliad was the scene of a bloody contest (1812) between the so-called 'Republican Army of the North,' under Magee and Gutierrez, and the Mexicans. Here Magee died, evidently assassinated.

In the Texas revolution (1835) Goliad was a point of strategical importance to the Texans. It was captured by Ben Milan and Collingsworth and became the base of military operations. The independence of Texas was declared here 1835, Dec. 20. Ira Ingram and Philip Dimmit were the leaders in formulating this declaration, and at the meeting there were 92 soldiers and all the citizens of the town. The official declaration of independence was made at Old Washington, 1836, March 2. In Goliad, on Palm Sunday, 1836, March 27, the Mexican commander, Urrea, caused to be slaughtered 300 unarmed men who had surrendered, Fannin and his command. These defenseless men had been promised life and liberty before being marched out in squads and shot down like dogs. Urrea claimed he acted under orders from Santa Anna (q.v.). Afterward a rallying cry of the Texas troops under Sam Houston was 'Remember Goliad.' In 1902 Goliad was visited by a disastrous cyclone which swept away almost the whole town. Pop. 2,000.

GOLIARD, n. *gō'lĭ-ârd*: in *chh. hist.*, one of the authors of the poems bearing the name of Golias (see below), hence generally a writer of satirical poetry; a satirist. GOLIARDERY, n. *gō'lĭ-ârd-ėr-ĭ*, name given to the series of satirical Latin poems directed against the abuses of the Rom. Cath. Church in the 13th c. GOLIAS, n. *gō'lĭ-as*, name under which certain satirical poems on ecclesiastical subjects were given to the world in the 13th century.

GOLIATH. See GATH.

GOLI'ATH BEE'TLE (*Goliathus*): genus of tropical coleopterous insects, of the section *Pentamera*, remarkable for the large size of some, particularly the African species. They are of splendid colors. Little is known of their habits.

GOLITZIN, or *go-lēt'zēn* (or GOLYZIN, or GALITZIN, or GALYZIN, or GALLITZIN, *gâ-lēt'sēn*): one of the most numerous, powerful, and distinguished Russian families. It derives its origin from the Lithuanian prince Gedimin, founder of the Jagellonian dynasty of rulers in Poland, Hungary and Bohemia. Among the leading members of the family are—1. The princes MICHAIL and DIMITRI GOLITZIN, Russian commanders under Wassili IV., grand-duke of Warsaw, who were taken prisoners by the Poles at the battle of Orscha 1514. Dimitri died in captivity, and Michail was released only after a confinement of 38 years.—2. WASSILI GOLITZIN, surnamed the Great, b. 1633, councilor and favorite of Sophia, sister of Peter the Great and regent during his minority. Wassili was a man of liberal culture and civilized tastes. His great aim was to bring Russia into contact with the west of Europe, and to encourage the arts and sciences. His design to marry Sophia, and plant himself on the Russian throne, however, miscarried: Sophia was placed by her brother in a convent, and Wassili was banished to a spot

on the Frozen Ocean , where he died of poison.—3. Boris Golitzin, cousin of Wassili Golitzin, was Peter the Great's tutor, and one of the administrators of the kingdom during the czar's first journey abroad.—4. Dimitri Golitzin, also cousin of Wassili was a distinguished Russian statesman; ambassador at the Turkish court; afterward director of the imperial finances; and finally head of the reform party of Golitzin and Dolgoruki, which wished to limit the absolute authority of the czar. Dimitri's plan failed; the two families were banished, and Dimitri himself ended his days in the dungeons of Schüsselburg.—5. Mikhail Golitzin, b. about 1675, brother of Dimitri, and one of the most distinguished Russian generals. He was the inseparable companion of Peter the Great in all his campaigns. His most famous achievement was the conquest of Finland. He died at Moscow, 1730.—6. Dimitri Golitzin, b. 1738, went as Russian ambassador to France 1763, and to Holland 1773. He died 1803. He wrote one or two books, but he owes the preservation of his name mainy to his wife, the celebrated Amalie, Princess Golitzin, daughter of the Prussian general, Count von Schmettau. This lady (b. at Berlin, 1748, Aug. 28) was remarkable for her literary culture, grace and amiability of disposition and sympathetic relations with scholars and poets, but, above all, by her ardent pietism, which found its most congenial sphere in the mystic and venerable sanctities of Rom. Catholicism. Having separated from her husband, she took up her residence in Münster, where she gathered round her a circle of learned companions. Here resided for a longer or shorter time Von Fürstenberg, Goethe, Jacobi, and others, but her most attached friends were Hemsterhuis and Hamann. She is the *Diotima* to whom the former of these, under the name of Dioklas, addressed his *Lettre sur l'Athéisme* (1785). She largely contributed to the conversion of Count Stolberg and his family to Rom. Catholicism, and called forth that excess of religious feeling which for a considerable period characterized many circles of German society, and which Voss so sharply reproved in his *Wie ward Fritz Stolberg ein Unfreier* (How Fritz Stolberg became a Slave). The Princess Amalie died 1806, Aug. 24.—Compare *Denkwürdigkeiten aus dem Leben der Fürstin Amalie von G.* (Münster 1828).—7. Dimitri Augustine Golitzin, son of Princess Amalie, b. at the Hague, 1770, Dec. 22. He became a Rom. Catholic in his 17th year, shortly after his mother; and through the influence exercised over him by a clerical tutor during a voyage to America, he resolved to devote himself to the priesthood. In 1795, Dimitri Augustine was ordained a priest in the United States by Bp. Carroll of Baltimore, and betook himself to a bleak region among the Alleghany Mountains, in Pennsylvania, where he was known as 'Father Smith.' Here he laid the foundation of a town,

called Loretto, where he died 1840, May. A monument was erected to his memory in a neighboring village, 1848. He was austere in his mode of life, but liberal in the highest degree to others, and an affectionate and indefatigable pastor. He wrote various controversial works, some of which are still largely read in the United States; e.g., *Defense of Catholic Principles*, *Letter to a Protestant Friend*, and *Appeal to the Protestant Public*.—8. Prince EMANUEL GOLITZIN, b. Paris, 1804, studied in that city, and afterward entered the Russian army. He translated into French Wrangel's book on northern Siberia, and wrote an interesting work, entitled *La Finlande: Notes recueillies en* 1848 (2 vols. Paris 1852). He died at Paris 1853, February.

GOLOMYN'KA (*Comephorus Baikalensis*): remarkable fish, found only in Lake Baikal, the only known species of its genus, which belongs to the goby family. It is about 12 inches long, is destitute of scales, and is very soft, its whole substance abounding in oil, which is obtained from it by pressure. It is never eaten.

GOLORE. See GALORE.

GOLOSH, n. *gŏ-lŏsh'* [F. *galoche*, a golosh, a clog—from mid. L. *călŏpĕdĭă*, a wooden shoe]: a shoe worn over another to keep the foot dry. The French applied the term *galoche* at first to shoes partly of leather, partly of wood, the soles being wood, and the uppers leather. The term was introduced into England as a cordwainer's technicality, to signify a method of repairing old boots and shoes by putting a narrow strip of leather above the sole so as to surround the lower part of the upper leather. It was adopted also by the patten and clog makers to distinguish what were also called French clogs from ordinary clogs and pattens. Clogs were mere soles of wood with straps across the instep to keep them on; pattens were the same, with iron rings to raise them from the ground; but the galoshes were wooden soles, usually with a joint at the part where the tread of the foot came, and with upper leathers like very low shoes. By the term goloshes is now generally meant what are known in the United States as India-rubber over-shoes (see OVER-SHOES). GOLOSH'ES, n. plu. *-ĕz*. GOLOSHED', a. *-lŏsht'*, applied to half-boots in which the parts passing round the ankles are of a different material from the rest of the upper—generally of a finer quality of leather, with elastic gussets at sides, or made to lace or button: also GALOCHE, or GALOSHE.

GOLPE, *gŏlp*, in Heraldry: a roundel purpure; sometimes called a *wound*. See ROUNDEL.

GOMARISTS, *gō'mar-ĭsts*, or CONTRA-REMONSTRANTS, *kŏn'tra rē-mŏn'strants*: opponents of the doctrines of Arminius (q.v.), founder of the Dutch Remonstrants. The party was named from its leader, Francis Gomar, theologian; 1563, Jan. 30—1641, Jan 11; b. Bruges.

In 1594 he was appointed prof. of divinity at Leyden, and signalized himself by his vehement antipathy to the views of his colleague, Arminius, and at the synod of Dort, 1618, he was mainly instrumental in securing the expulsion of the Arminians from the Reformed Church.

GOMBROON, *gŏm-brôn'*, called also BENDER- or BUNDER-ABBASI: town and seaport of Persia, at the mouth of the Persian Gulf, in the Strait of Ormuz, opposite the island of Ormuz. BENDER-ABBASI owed its name and importance to Shah Abbás, who, assisted by the English, drove the Portuguese 1622 from Ormuz, or Hormuz, then a flourishing commercial town on the island of the same name, ruined the seaport, and transferred its commerce to Gombroon. For some time Gombroon prospered, French, Dutch, and English factories were erected here, and the population rose to about 30,000. A dispute among the natives, however, resulted in the destruction of the European factories and houses, and only the ruins of these remain.

GOMER, n. *gō'mėr* [Heb. a mound, a heap]: same as HOMER—a measure (q.v.).

GOMERA, *gō-mā'râ*: one of the Canary Islands (q.v.).

GOMEZ, *gō'mĕz*, ESTEVAN: d. 1525, Oct.; b. Portugal: explorer. He was pilot of Magellan's ship *San Antonio* on the voyage of discovery 1519. When the fleet reached Magellan's Strait, he was sent in the *San Antonio* to explore a channel further s., and on the way headed a mutiny, placed the capt. in irons, and returned to Spain, 1521, Mar. In 1524 he started on a search for a n.w. passage to the Moluccas, reached New York Bay, sailed some distance up the Hudson river, and then along the n.e. coast and up the Penobscot.

GOMEZ, MAXIMO: a Cuban military officer; b. Bani, San Domingo, 1838; d. Havana, Cuba 1905, June 18; served in Spanish army, which he accompanied to Cuba when the freeedom of San Domingo was declared. Subsequently he was angered by the abuse of some Cuban refugees by Gen. Villas, and after assaulting that officer withdrew from the Spanish army. In 1868 he joined the Cuban revolt known as the Ten Years' War; was promoted maj-gen., and later made commander-in-chief. When the war of 1895-98 broke out he again took up arms against Spain and gallantly fought till Cuba was occupied by American troops. On 1899, Feb. 25, after marching through Havana at the head of 2,500 Cuban soldiers, he was tendered a reception in that city by the U. S. military authorities. In recognition of his services in the cause of liberty, the republic of Cuba bestowed upon him two sums of $50,000 and $100,000 respectively, the latter being delivered to his family on the day of his death.

GOMPERS, SAMUEL, American labor leader: b. Lon-

don, England, 1850, Jan. 27. A cigar maker by trade, he has been known as a zealous worker in the cause of the rights of labor, since his boyhood. He has been active in efforts to organize the working people, and was one of the founders of the American Federation of Labor, of which he is president. He has exerted much influence and has put forth various pamphlets on the labor question and the labor movement in general.

GOMPHOSIS, n. *gŏm-fō'sĭs* [Gr. *gomphos*, a nail]: in *anat.*, a form of joint in which a conical body is fastened into a socket, as the teeth in the jaw. GOM'PHOLITE, n. *-fō-līt* [Gr. *lithos*, a stone]: in *geol.*, a name applied to certain sandy conglomerates which occur in vast thickness at the foot of the Alps in the great Swiss valley.

GOMPHRENA, n. *gŏm-frē'nâ* [changed from L. *gromphœna*, a kind of amaranth, probably *Amaranthus tricolor*]: typical genus of *Gomphreneæ*, a tribe of *Amaranthaceæ*.

GOMUTO, *gŏ-mô'tō*, or ARENG, *â'rĕng*, or ARENGA, or EJOO PALM, *ē'jô pâm* (*Arenga saccharifera*, *Saguerus Rumphii*, or *Borassus gomutus*): an important palm which grows in Cochin China and in the interior of Java, Sumatra, Celebes, and Amboyna, on dry ground. The stem is 20-30 ft. high; the leaves 15-25 ft. long, pinnated. The flowers are in bunches 6-10 ft. long; the fruit is a yellowish-brown, three-seeded berry, of the size of a small apple, and extremely acrid. The stem, when young, is entirely covered with sheaths of fallen leaves, and black horsehair-like fibres, which issue in great abundance from their margins; but as the tree increases in age, these drop off, leaving an elegant naked columnar stem. The strongest of the fibres, resembling porcupine quills in thickness, are used by the Malays as styles for writing on the leaves of other palms. But the finer fibres are by far the most valuable; they are well-known in eastern commerce as Gomuto or Gomuti or Ejoo fibre, and are much used for making strong cordage; particularly for the cables and standing-rigging of ships, European as well as native. Want of pliancy renders them less fit for running-rigging, and for many other purposes. They need no preparation but spinning or twisting. No ropes of vegetable fibre are so imperishable, when often wet, as those Gomuto fibre. At the base of the leaves of the Gomuto palm there is a fine woolly material, called *bara*, much employed in caulking ships and stuffing cushions. The saccharine sap, obtained in great abundance by cutting the spadices of the flowers, is a delicious beverage, and by fermentation yields an intoxicating wine (*neroo*), from which a spirituous liquor called *brum* is made. In Java, a brown sugar, much used by the natives, is made by boiling the sap.

GONAKIE, n. *gŏn-â'kĭ* [an African word]: in *bot.*, *Acacia Adansonii*. It yields good timber.

GONANGIUM, n. *gō-năn′jĭ-ŭm* [Gr. *gonos*, offspring, *anggcion*, a vessel]: the chitinous receptacle in which the reproductive buds of certain of the hydrozoa are produced.

GONCOURT, *gōng-kôr′*, Edmond Louis Antoine Huot de: 1822, May 26—1896, July 16; b. Nancy: prolific French writer: also, his brother, Jules Alfred Huot de (1830-70). The Goncourt brothers were not men of letters but artists primarily, and in 1849 they set out, knapsack on back, to traverse France for drawings and water-colors. Their note-books made them writers as well as artists, and already in 1852 they had commenced that literary partnership which continued nearly 20 years. Their earliest serious works were a group of historical studies upon the second half of the 18th century, intended to be an effective resurrection of its habits of life, manners, and costume, which, though elaborate in detail lacked calm and impartial historical sense, breadth of view, and creative grasp of character. These books were: *Histoire de la Société Française pendant la Revolution* (1854), *La Société Française pendant le Directoire* (1855); *Portraits intimes du XVIII. Siècle* (1856-8); *Histoire de Marie Antoinette* (1858); *Les Maîtresses de Louis XV.* (1860), *La Femme au XVIII. Siècle* (1862), and *L'Amour au XVIII. Siècle* (1875); *Gavarni* (1873), and *L'Art au XVIII. Siècle* (1874). The more important work of the De Goncourt brothers was their novel writing; their conception of the novel was that it should be an imaginative attempt to grasp and summarize the results of close observation; their aim was to paint manners by taking the traits in which one man resembles a class; hence they select as generic types only persons of moderate faculties. Their novels include: *Les Hommes de Lettres* (1860), republished in 1869 under the title *Charles Demailly; Sœur Philomène* (1861); *Renée Mauperin* (1864); *Germinie Lacerteux* (1865); *Manette Salomon* (1867); and *Madame Gervaisais*. After the death of his brother, Edmond wrote the *La fille Elisa* (1878), a novel; *L'Œuvre de Watteau* (1876); *L'Œuvre de Prudhon* (1877); and *La Maison d'un Artiste* (1881). Consult: Bellock and Shedlock, *Edmond and Jules de Goncourt*.

GONDA, *gŏn′da*: dist. of Oudh, India; bounded n. by the Himalayas, e. by the Basti dist., s. by Fyzabad and Bara Banki, w. by Bharaich; lat 26° 40′—27° 50′ n., long. 81° 35′—82° 48′ e.; 2,824 sq. m. The surface, a rich alluvial deposit, is divided into swampy, upland, and lowland belts, drained chiefly by the Gogra and Rápti rivers, and irrigated by means of numerous small lakes. Several species of wild animals and large game birds abound. There are 5 towns, with a pop. exceeding 5,000 each, Gonda, Balrámpur, Colonelganz, Nawabganj, and Utraula. The dist. exported rice

and food grains, and imported cotton, salt, and European piece-goods. Pop. about 1,300,000.

GONDA is the chief town of Gonda dist., lat. 27° 8′ n., long. 82°1′ e.; formerly noted for manufactures of shields but now of slight importance. It contains a civil station dispensary, school and literary institute, court-house, and jail. Pop. 13,722.

GONDAR, *gŏn′dâr*: city of Abyssinia, former cap. of the kingdom of Gonda or Amhara: lat. 12° 36′ n., and long. 37° 29′ e.; on an insulated hill 7,420 ft. above sea-level, and 30 m. from the n. shore of Lake Dembea or Izana (see ABYSSINIA). Gondar is the seat of the archbishop of Abyssinia, and was formerly the residence of the emperor or *Negus*. At one time it had 50 to 100 churches and about 50,000 inhabitants; pop. at present about 7,000; but the latest returns show 44 churches, with nearly 1,200 priests, besides numerous monks and nuns. It is poorly and irregularly built, and resembles a forest as much as a city, on account of the number of trees surrounding the houses. The palace, a square stone structure flanked with towers, is the most important building. There are no shops or bazaars, all articles for sale being exposed on mats in the market-place. Gondar has manufactures of fire-arms, sword-blades, knives, scissors, razors, shields, pottery, etc.; and considerable transit-trade between Massuah on the Red Sea and the s. of Abyssinia, in slaves, musk, wax, ivory, coffee, honey, etc. Part of the town was burned by the dervishes 1889.

GONDOLA, n. *gŏn′dō-lă* [It. *gondola*]: Venetian pleasure-boat or barge. GON′DOLIER′, n. *-lēr′*, a man who rows a gondola.—The *Gondola* is a long narrow boat (averaging 30 ft. by 4) used chiefly on the canals of Venice. The prow and stern taper to a point, and curve out of the water to a height of at least 5 ft. In the centre there is a curtained chamber for the occupants: the boat is propelled by means of oars or poles by one, two, or occasionally four men. The rowers stand as they row, and wear the livery of the family to which the gondola belongs.—The term gondola is also applied to passage-boats having 6 or 8 oars, used in other parts of Italy.

GONDWANA, *gŏnd-wâ′na*: land of the Gonds; hilly tract of Hindustan, between 19° 50′ and 24° 30′ n. lat., and in e. long. between 77° 38′ and 87° 20′. It occupies a somewhat central position, sending its drainage at once n. into the Jumna, e. through the Mahanadi into the Bay of Bengal, and w. through the Tapti and the Nerbudda into the Arabian Sea—the water-shed in some places attaining an elevation of 5,000 ft. So isolated a locality, itself unfavorable to civilization, is rendered still more so by the extreme barbarism of the inhabitants, who are regarded, with some appearance of probability, as the genuine aborigines of India and

as perhaps allied to the Davidians who dwell s. of them. They are of low stature, seldom exceeding 5 ft.; and are without written language, and pantheistic in religion. Wives are bought, and the women perform the manual labor while the men apply themselves to the chase. Their total number in central India is about 1,500,000. It is certain that the country has never really formed a part of any of the great empires in the east.

GONE, *gŏn*: pp. of Go, which see.

GONEPTERYX, n. *gŏn-ĕp'tĕr-ĭks* [Gr. *gōnia*, a corner, an angle, or *gonu*, the knee; *pterux*, a wing]: genus of butterflies, family *Papilionidæ*, sub-family *Pieridi*. *G. rhamni* is the brimstone butterfly. Its wings have an angular projection and are brimstone-colored.

GONFALON, n. *gŏn'făl-ŏn*, or GONFANON, n. *gŏn'fa-nŏn* [It. *gonfalone*; OF. *gonfanon*— from mid. H. Ger. *gunt* or *gund*, battle]: in *OE.*, an ensign; a standard; in virtue of bearing which, the chief magistrates in many Italian cities were known as Gonfaloniers.

GONG, n. *gŏng* [Chinese or Malay; probably imitative of the sound]: Chinese and Indian musical instrument of percussion, circular like the lid of a pot or caldron, and beaten with a stick like a drum; a metal drum. It is made of a mixture of metals (78 to 80 parts of copper, and 22 to 20 parts of tin), and shaped into a basin-like form, flat and large, with a rim a few inches deep. The sound of the gong is produced by striking it while hung by the rim, with a wooden mallet, which puts the metal into an extraordinary state of vibration, and produces a loud, sometimes deep, sometimes piercing sound.—The term is applied sometimes also to signal-bells, door-bells, etc., struck by a hammer.

GONGORA, *gōn'go-rá*, LUIS Y ARGOTE: Spanish poet: 1561, July 11—1627, May 24; b. Cordova. He studied law at the Univ. of Salamanca, where he composed the greater part of his erotic poems, romances, and satires. At the age of 45 he took priest's orders, and obtained a small prebend in the cathedral of Cordova; was afterward appointed chaplain to Philip III., and died in his native city. Gongora's poetic career divides itself into two periods. In his *first* or youthful period, he yielded to the natural tendencies of his genius, and to the spirit of the nation. His lyrics and romances of this period are in the old genuine Spanish style; and in caustic satire and burlesque wit, are admirable specimens of their class. Gongora, however, had the ambition to outdo all predecessors, and to furnish something wholly new: and he introduced a new poetic phraseology, called the *estilo culto*, or 'cultivated style.' To popularize the *estilo culto*, he wrote *Polifemo*, *Soledades*, and the *Fables of Pyramus and Thisbe*, which mark his *second* period—productions pedantic and

tasteless, poor in invention, but rich in pompous phrases, absurd imagery, and obscure mythological allusions. In this way he became the founder of a new school, the *Gongoristas* or *Cultoristas*, who, lacking their master's undeniable genius, surpassed him in the depravity of their literary tastes. Gongora has been called the 'Andalusian Pindar.' See Churton's excellent work, Gongora, *an Historical and Critical Essay, with Translations* (1862).

GONGYLUS, n. *gŏn'jĭl-ŭs* [Gr. *gonggŭlos*, round]: in *bot.*, applied to round hard bodies produced on certain *algæ*, which become ultimately detached, and germinate. Gon'gyli, n. plu. *-jĭl-ī*.

GONIASTER, n. *gō'nĭ-ăs'tėr* [Gr. *gōnĭă*, an angle; *aster*, a star]: a genus of star-fishes, popularly known as *cushion-stars*.

GONIATITES, *gō-nĭ-a-tī'tēz*: genus of fossil cephalopodous mollusca, belonging to the same family as the ammonites. The genus is characterized by the structure of the septa, which are lobed, but without lateral denticulations, as in ammonites; they consequently exhibit, in a section, a continuous undulating line. Some forms with slightly waved septa approach very near to the nautilus, from which, however, they are separated by the position of the small and delicate siphuncle, which is on the dorsal or external side of the shell. The lines of growth on the external surface have a sigmoid direction. The siphonal portion is shorter than the sides, forming a sinus at the back, as in the nautilus. The last chamber, the one tenanted by the animal, occupies a whole whorl, and has besides a considerable lateral expansion. The shells are small, seldom exceeding six inches in diameter. This genus is confined to the Palæozoic strata: upward of 150 species have been described from the Devonian, Carboniferous, and Triassic measures.

GONIDIA, n. *gō-nĭd-ĭ-ă* [Gr. *gonos*, offspring, seed; *sidos*, appearance]: in *bot.*, green germinating cells in some cryptogamous plants, apparently serving the purpose of reproduction, but now considered as the algæ on which the remaining part of the lichen is parasitic. It is not, however, certain that the bodies called gonidia in different classes of cryptogamous plants are all of exactly the same nature. The gonidia of Lichens (q.v.) are found in layers in the interior of the thallus. In some of the lowest vegetable organisms, as *Desmidiaceæ*, the gonidia are formed by the *endochrome* or contents of the cell breaking up into granules, sometimes invested with cilia, and moving as zoospores, at first within the cavity of the cell in which they are formed, and afterward without it.

GONIOMETER, n. *gŏn'ĭ-ŏm'ĕ-tėr* [Gr. *gōnĭă*, an angle *metron*, a measure]: instrument for measuring solid angles, particularly angles of crystals. The simplest

is that invented by Carangeau, which consists of two brass rulers turning on a common centre, between which the crystal is so placed that its faces coincide with the edges of the rulers, and the angle is measured on a graduated arc. For large crystals this is sufficiently accurate, but, as many minerals are found crystallized only in small crystals, and as small crystals of any mineral are generally the most perfect, an instrument more exact was invented by Wollaston and improved by Naumann. This reflecting goniometer measures very small crystals with certainty to within a single minute (1′), by the reflection of the rays of light from the surface of the different faces of the crystal. Go′niom′etry, n. *-trĭ*, the art of. Go′niomet′rical, a. *-ō-mĕt-ri-kăul*, pertaining to.

GONIOPHOLIS, n. *gō-nĭ-ŏf′o-lĭs* [Gr. *gōnia*, corner, angle; *pholis*, horny scale of a reptile]: in *paleon.*, genus of fossil crocodiles, placed by Sir Richard Owen under his sub-order *Amphicœlia*, and by Prof. Huxley doubtfully under that which he terms *Mesosuchia*. The remains on which the genus was founded were found, 1835, in a quarry near Swanage. The species is *goniopholis crassidens*, sometimes called the *Swanage crocodile*.

GONOBLASTIDIA, n. plu. *gŏn′ō-blăs-tĭd′ĭ-ă* [r. *gŏnos* offspring; *blastidĭŏn*, a dim. of *blastos*, a bud]: the processes which carry the reproductive receptacles or 'gonophores' in many of the hydrozoa.

GONOCALYX, n. *gŏn′ō-kā′lĭks* [Gr. *gŏnos*, offspring; *kalux*, a cup]: the swimming-bell in a medusiform gonophore; the same structure in a gonophore which is not detached.

GONOPHORE, n. *gŏn′ŏ-fōr* [Gr. *gŏnos*, offspring, *phorĕō*, I bear]: in *bot.*, an elevated or elongated receptacle, bearing the stamens and carpels in a prominent and conspicuous manner; the generative buds or receptacles of the reproductive elements in the hydrozoa.

GONORRHEA, n. *gŏn′ŏr-rē′ă* [Gr. *gŏnē*, semen; *rhĕō*, I flow]: most frequent form of venereal disease. Gon′orrhe′al, a. *-rē′ăl*, of, or pertaining to *Gonnorrhea* was a term originally applied almost indiscriminately to all discharges from the genital passages in both sexes, but especially in the male. In the course of usage, the term has become restricted almost entirely to one particular kind of discharge, which is due to the presence of a specific microbe, the gonococcus. This form of the disease is, in the great majority of cases, caused by the direct communication of sound persons with those already affected; accordingly gonorrhea is one of the numerous penalties attending an indiscriminate and impure intercourse of the sexes (see Syphilis). The disease may reach its height in a period of from 1 to 3 weeks; it then usually subsides, and the various symptoms abate in severity, but it is liable to leave its traces in the more chronic form of gleet, which may

last for a considerable time. For gonorrheal ophthalmia, see OPHTHALMIA. Victims of gonorrhea and the allied disorders should consult medical men of high-standing and undoubted character. Advertisements, often an offense to decency, by an unworthy class of practitioners, often arrant quacks, who retort vast sums of money by threat of exposure, should act as warnings of avoidance rather than as attractions. The disease is often regarded lightly as an affair of slight importance, involving at the most a few days or weeks of pain and discomfort, but in reality it is, chiefly in its dire consequences to the innocent, one of the greatest scourges of mankind. The specific germ of the disease lingers in latent form for years after the symptoms have entirely disappeared, and one who harbors them may be an active cause of infection even throughout life. The innocent wife, married years after her husband's indiscretion, may become infected and suffer thereby from a virulent inflammation of the pelvic organs, demanding a serious operation and even jeopardizing her life. The remote consequences to the man himself, in the way of stricture of the passages or sterility, may be most serious. The disease may also become constitutional, manifesting itself as a severe and crippling form of rheumatism. No man who has ever suffered from gonorrhea should marry until he has been examined by a specialist and pronounced entirely free from traces of the malady.

GONOSOME, n. *gŏn'ŏ-sōm* [Gr. *gŏnos*, offspring; *sōma*, body]: one of the reproductive zooids of a hydrozoon.

GONOTHECA, n. *gŏn'ŏ-thē'kă* [Gr. *gŏnos*, offspring; *thēkē*, a chest, a case]: the chitinous receptacle within which the gonophores of certain of the hydrozoa are produced.

GONSAL'VO, or GONZAL'VO. See GONZALO.

GONVILLE AND CAIUS COLLEGE, CAMBRIDGE: originally founded 1348 by Edmund Gonville, son of Sir Nicholas Gonville, rector of Terrington, in Norfolk, and endowed for a master and three fellows. In 1353, William Bateman, Bp. of Norwich, whom Gonville had appointed his executor, removed from the college to its present site, and altered the name to the 'Hall of the Annunciation of Blessed Mary the Virgin.' In 1558, Dr. Caius obtained a royal charter, founding the college for the third time, and altering the name to that which it now bears. By statute, the college consists of a master, 30 fellows, and 36 scholars; but two fellowships have been added—one in 1865, another in 1870. There are also five college studentships in medicine, founded by Christopher Tancred, each of the annual value of £100.

GONZAGA, *gon-zâ'gâ* (or GONZUGUE), HOUSE OF: old princely family of Italy; of German origin, tracing its

descent from Emperor Lothaire. It came into notice first in the 11th c., and from it sprang a long line of sovereign Dukes of Mantua and Montferrat. The sway of this race over Mantua continued more than three centuries, and many of its members were magnificent promoters and cultivators of arts, science, and literature. Wielding originally in the state the vast civic influence which in so many instances were exercised by families of weight in the history of Italy, the Gonzagas gradually monopolized all the chief posts of command, both civil and military; and finally, 1432, were invested with the title and jurisdiction of hereditary marquises, and 1530 with that of dukes or sovereigns of the state. After their elevation to ducal dignity, they continued to own the feudal supremacy of the empire, and were the faithful champions of the imperial interests in their policy with other states. The house of Gonzaga, and that of the Vis. conti Dukes of Milan, were perpetually at war.—The most illustrious personages of this house were the following: GIOVANNI FRANCESCO (1407—44), in whose favor Mantua was created a marquisate by the Emperor Sigismund, in return for his services to the empire.—GIAN FRANCESCO (1484—1519) defeated Charles VIII. of France at the battle of Fornovo, on the banks of the Taro, 1495, when Gonzaga left 3,500 troops on the field, and Charles was forced to a hasty retreat. Gonzaga also took part in the engagement of Atella, 1496, which led to the capitulation of the French forces.— FREDERICK II. (1519—40), son of Gian Francesco, in recognition of his services to the imperial forces in their contest with France, was invested by Emperor Charles V. with the ducal dignity 1530, and obtained the marquisate of Montferrat 1536. During the reign of this prince, the court of Mantua was one of the most magnificent and gay of Europe.—GUGLIELMO (1550—87), son of Frederick II., was humpbacked, but a wise and enlightened ruler; his secretary was Bernardo Tasso, father of the poet.—VINCENZO (1587—1612), son of Guglielmo, was the warm friend and patron of Tasso, and succeeded in obtaining the poet's freedom, when he was confined as insane, by Duke Alfonso d'Este. Vincenzo was much esteemed for piety, justice, and liberality. He was successively followed by his three sons, FRANCESCO, FERDINANDO, and VINCENTIO, who died without heirs, and thus the direct line of the ducal branch became extinct.

A collateral branch, in the person of Charles I., Duke of Nevers, son of Ludovico, the brother of Guglielmo, the humpbacked, claimed the duchy, which was contested by his cousin Cæsar, Duke of Guastalla. This family feud led to a general war, in which France supported Nevers, and the empire claimed the right of adjudging Mantua, as an imperial fief, to a candidate of imperial election. Mantua, in 1629, was stormed, sacked,

and stripped of all its magnificent possessions, by the imperialists, and never regained its former splendor. Charles de Nevers submitted finally to the emperor, and was installed in the duchy. The artistic treasures collected for ages by the Gonzaga princes were scattered throughout Europe, and came into the possession of several of the reigning sovereigns. The successors of Charles were dissipated and silly, and the tenth and last Duke of Mantua, Ferdinand-Charles, was the most contemptible and dissolute of all. As he had countenanced the French in the war of the succession, the Emperor Joseph I. deprived him of his states, placing him under the ban of the empire. He died in exile 1708, leaving no issue.

GONZALO DI CORDOVA, *gon-thâ'lō dē kawr'do-vâ* (GONZALO, or GONSALVO, HERNANDEZ Y AGUILAR): celebrated Spanish warrior: 1453, Mar. 16—1515, Dec. 2; b. Montillo, near Cordovo. He served with great distinction first in the war with the Moors of Granada, afterward in the Portuguese campaign. At the close of the final contest with Granada, he concluded the negotiation with Boabdil (Abu Abdallah), king of the Moors, in such a masterly manner, that the rulers of Spain bestowed on him a pension and a large estate in the conquered territory. He was next sent to the assistance of Ferdinand, king of Naples, against the French. In less than a year Gonzalo, with his limited resources, had conquered the greater part of the kingdom, and obtained the appellation of 'El Gran Capitano.' In conjunction with King Ferdinand, he succeeded in completely expelling the French from Italy; and 1498, Aug., returned to Spain, having received for his services an estate in the Abruzzi with the title of Duke of San Angelo. When the partition of the kingdom of Naples was determined on by a compact at Granada, 1500, Nov. 11, Gonzalo again set out for Italy; with a body of 4,300 men, and on the way took Zante and Cephalonia from the Turks, and restored them to the Venetians. He then landed in Sicily, occupied Naples and Calabria, and demanded from the French that, in compliance with the compact, they should yield up Capitanata and Basilicata. This demand being rejected, a war broke out, which was waged with varied success. After the victory of Cerignola, 1503, Apr., Gonzalo took possession of Calabria, Abruzzo, Apulia, even the city of Naples itself, and then laid siege to Gaëta, but was forced to retreat before a superior force of the enemy. Dec. 29 of the same year, he fell upon them unexpectedly near the Carigliano, and obtained a complete victory. The French army was almost annihilated; the fortress of Gaëta fell, and the possession of Naples was secured to the Spaniards. King Ferdinand bestowed the duchy of Sesa upon the conqueror, and appointed him viceroy of Naples, with unlimited authority. His good fortune, however, made him many powerful enemies, and Gonzalo was recalled

to Spain, where the king treated him with marked neglect. Gonzalo then betook himself to his estates in Granada; but after the defeat of the new viceroy in Naples by Gaston de Foix he was again appointed to the command of the Spanish-Italian army. Mental suffering, however, had undermined the old hero's health, and he died at Granada.

GOOD, a. *gûd* [AS. *gód;* Dut. *goed;* Icel. *gódr;* Ger. *gut;* Gr. *agăthos*, good]: the opposite of *bad;* pious; sound; undamaged; proper or fit; considerable; having sufficient; pleasant to the taste; unblemished; kind; favorable; convenient; clever; beneficial; comely—as, she is *good*-looking; real—as, he is in *good* earnest; in the sense of wishing well—as, *good*-day, and *good*-by: N. the contrary of evil; virtue; righteousness; benefit; advantage: INT. a word expressing approbation or admiration. GOODS, n. plu. *gûdz*, household furniture; wares; merchandise. GOOD'LY, a. *-lĭ* [AS. *gódlíc*]: being of a handsome form; fine. GOOD'LIHEAD, n. *-lĭ-hĕd*, in *OE.*, grace; goodness. GOOD'LIEST, a. most good or excellent. GOOD'LINESS, n. beauty of form; grace. GOOD'NESS, *n.* kindness; benevolence; Christian excellence; mercy. GOODY, n. *gûd'ĭ*, a familiar contr. for goodwife; a child's name for a sweetmeat. AS GOOD AS, the same as; no worse than; in effect; virtually. A GOOD MANY, a considerable number. IN GOOD TIME, early enough. GOOD-BREEDING, polite manners. GOODMAN, GOODWIFE, applied to the master and mistress of a house, implying some degree of respect. GOOD WOMAN, a familiar, but not quite respectful, term of address. GOOD MANNERS, politeness. GOOD SENSE, sound judgment. GOOD-WILL, kind feeling; favor; the benefit of a business in full operation, for which a price may be paid. GOOD FELLOW, a kind man; a boon companion. GOOD-FELLOWSHIP, merry society; pleasant company. GOOD-HUMOR, a cheerful temper or state of mind. GOOD-HUMORED, a. being of a cheerful temper. GOOD-HUMOREDLY, ad. GOOD-NATURE, mildness and kindness of disposition. GOOD-NATURED, a. possessing a mild disposition. GOOD-NATUREDLY, ad. GOOD-TEMPERED, having a temper not easily irritated. GOOD HEED, due caution; great care. TO MAKE GOOD, to supply deficiency; to prove or establish; to fulfil; to indemnify for. TO STAND GOOD, to be firm or valid. AS GOOD AS HIS WORD, performing what was promised. FOR GOOD AND ALL, completely; wholly. GOOD-BY, or GOOD-BYE, *-bī* [a probable contraction of *God be with you*]: a salutation at leave-taking. GOOD-SPEED, an old form of wishing success—another form of *God speed you.* GOODS AND CHATTELS, in *law*, personal and movable things as distinguished from lands and tenements.—SYN. of 'good, a.': serviceable; useful; admirable; excellent; commendable; virtuous; religious; benevolent; humane; merciful; propitious; gracious; friendly; suited; suitable; adapted; skilful; handy; dexterous; sufficient; competent; adequate; valid; serious; actual; full; complete.

honorable; fair;—of 'good, n.': prosperity; possession; property;—of 'goods': chattles; commodity; merchandise; freight; effects; wares; property; possession.

GOOD, *gûd*, JOHN MASON: 1764, May 25—1827, Jan. 2; b. Epping, in Essex: physician and author. He commenced practice as a surgeon, Sudbury, 1784, but meeting little success, he removed to London, 1793, principally for literary employment. In addition to *The Book of Nature*, by which chiefly he is known, and which appeared shortly before his death, he published various poems, translations, and professional treatises. Among his translations, were *Song of Songs, or Sacred Idylls*, trans. from the Hebrew, 1803; translation of Lucretius, in verse, 1805; of the Book of Job, 1812; of the Book of Proverbs, 1821; and of the Book of Psalms. His *Study of Medicine* (4 vols. 1822) was a learned but untrustworthy work. In conjunction with Olinthus Gregory and Bosworth, he published the *Pantologia or Encyclopœdia, comprising a General Dictionary of Arts, Sciences, and General Literature*, 11 vols., completed, 1813. He died in London. Dr. Olinthus Gregory, published a memoir of his life, 1828.

GOODALE, *gûd'āl*, DORA READ: author: b. Mt. Washington, Mass., 1866, Oct. 29. She was brought up on her father's farm, learned to read at an early age and began composing verses as soon as she could write. In 1871 her sister Elaine, established a monthly paper entitled *Sky Farm Life*, to which both sisters contributed verses and other compositions regularly. The sisters have published jointly *Apple Blossoms; Verses of Two Children*, with portraits (New York, 1878); *In Berkshire with the Wild Flowers* (1879); and *Verses from Sky Farm* (1880).

GOOD'ALE, ELAINE: author: b. Mount Washington, Mass., 1863, Oct. 9. She was brought up in like manner with her sister Dora Read Goodale, was equally precocious in composing verses, and was appointed a teacher in the Hampton Normal and Agricultural Institute, Va., 1883. She there became interested in the education of Indian children, and two years afterward made a long visit to the Sioux reservation. In 1886 she was appointed a govt. teacher at the Lower Brule agency, White River Camp, Dak. She has been editor of the Indian Dept. of the *Southern Workman* since 1883, contributed articles to New York and Boston newspapers. In 1891 she married Dr. Charles A. Eastman, a full-blood Sioux Indian.

GOODALL, *gûd'al*, FREDERICK: eminent English artist: b. London, 1822, Sep. 17, d. there 1904, July 29. His first oil-picture was entitled, *Finding the Dead Body of a Miner by Torchlight*, for which the Soc. of Arts awarded him the large silver medal. During the summers 1838-42, he visited Normandy and Brittany, and 1839, when but 17 years of age, he exhibited his first

picture at the Royal Acad., *French Soldiers Playing Cards in a Cabaret.* His *Entering Church,* as well as *The Return From a Christening,* which received a prize of £50 from the British Institution, were among his early pictures. *The Tired Soldier,* exhibited 1842, is in the Vernon Gallery. Some of his French scenes are *Veteran of the Old Guard Describing His Battles, La Fête du Mariage, The Wounded Soldier Returned to his Family, The Conscript.* In 1844 he went for subjects to Ireland and later to N. Wales. Among his Irish scenes are, *Irish Courtship, The Irish Piper,* and the *Departure of the Emigrant Ship. The Village Festival,* is one of the best of his English subjects, exhibited 1847. His *Hunt the Slipper* (1849), *Raising the Maypole* (1851), *Arrest of a Peasant Loyalist—Brittany,* 1793 (1855), *Cranmer at the Traitor's Gate* (1856), *Rising of the Nile, Subsiding of the Nile, An Intruder on the Bedouin's Pasture* (1876), etc., added greatly to his reputation. He visited Egypt 1858. In 1852, Goodall was elected as associate of the Royal Acad., and 1863 a royal academician.

GOOD BEHAVI'OR, in Law: phrase rather popular than legal; usually synonymous with keeping the peace. Thus, if one person assaults another, or threatens or provokes him to a breach of the peace, the offense is punishable summarily by justices of the peace, who, besides inflicting a fine, may, and often do bind over the offending party to keep the peace, and be of good behavior for a period of six to twelve months. The offending person is required to give a bond for a specified sum; and if the recognizance is forfeited, then he may be again held for punishment.

GOODE, George Brown: an American naturalist; 1851, Feb. 13—1896, Sept. 6; b. in New Albany, Ind.; was graduated at Wesleyan University, 1879. He was placed on the scientific staff of the United States National Museum in 1873, and four years later was appointed assistant secretary of the Smithsonian Institution. He was the author of *Principles of Museum Administration; Catalogue of the Collection to Illustrate the Animal Resources of the United States; The Fisheries and Fishing Industry of the United States; American Fishes; A Popular Treatise Upon the Game and Food Fishes of North America; The Nature and Economic History of the American Menhaden;* etc.

GOODE, Richard Urquhart, American geographer: b. Bedford, Va., 1858, Dec., 8, d. 1903. He studied at the University of Virginia, was topographer to the United States Geological Survey in 1879-82, engineer and topographer of the Northern Transcontinental Survey in 1882-4, and in 1889 was appointed geographer of the United States Geological Survey. His writings include reports and articles in periodicals.

GOODE, William Athelstane Murray, American

newspaper correspondent: b. Newfoundland, 1875, June 10. After service in the British merchant marine and the United States cavalry, he became assistant night city editor of the New York *Recorder*, later city editor of the *Mercury*, correspondent of the Associated Press, of which he was representative on board the flagship New York during the Spanish-American war and news editor of the London *Standard*. He contributed to magazines and published *With Sampson Through the War* (1899).

GOODELL′, Henry Hill, American educator: b. Constantinople, Turkey, 1839, May 20; d. at sea 1905, April 23. He was graduated from Amherst College in 1862; was in the Union army in 1862-3; professor in the Massachusetts Agricultural State College in 1867-86, and in 1886 became its president. For several years he was chairman of the executive committee of the Association of American Agricultural Colleges and experiment stations, and in that capacity did much to further the interests of agricultural education.

GOODELL′, William: 1799–1879: abolitionist. He was educated in Providence, R. I., studied theol. and was licensed to preach but never ordained, and was early identified with the temperance and anti-slavery movements. Removing to New York he was engaged as editor of the *Emancipator*, organ of the State Anti-slavery Soc., and afterward of the Utica organ, *The Friend of Man*. On his return to New York he founded and edited *The Radical Abolitionist* and *The Principia*, in both of which he undertook to demonstrate that there was neither legal nor constitutional right for the existence of slavery, and that all courts of jurisdiction were fully empowered by statutes to regard and treat it as a crime. He wrote and spoke with great vigor in advocacy of his views, and published a work of wide research, *The History of Slavery and Anti-Slavery* (1851). During his career as a temperance advocate he edited *The Genius of Temperance* and other similar periodicals. He died in Janesville, Wis.

GOODELL, *gûd-ĕl′*, William, D.D.: 1792, Feb. 14—1867, Feb. 18; b. Templeton, Mass.: missionary. He graduated at Dartmouth College 1817, and Andover Theol. Seminary 1820, studied medicine, spent a year as agent of the A. B. C. F. M., and sailed for Malta 1822. After studying the Turkish and Armenian languages a year, he went to Beirut, where he engaged in missionary labor 5 years. On the withdrawal of consular protection 1828 he accompanied the other Syrian missionaries to Malta, where he remained till 1831, when he was ordered to undertake a mission among the Armenians in Constantinople. He labored there with distinguished success till 1865, when age and debility arising from climatic causes, led him to return to the United States. While his missionary labors were productive of

inestimable good, his great life-work was the translation of the whole Bible from the original Greek and Hebrew into Armeno-Turkish. He completed the New Test. 1830, Jan. 8, the Old 1841, Nov. 6, and revised both 1863. He received the degree D.D. from Hamilton College 1854, and at the time of his death in Philadelphia was publishing a serial in the New York *Observer*, entitled *Reminiscences of the Missionary's Early Life.*

GOODENIACEÆ, *gûd-ē-nĭ-ā'-sē-ē*: natural order oxogenous plants, of which about 150 species are known, mostly herbaceous, though a few are shrubs, and mostly natives of Australia and the islands of the Southern Ocean, a few being found in India, s. Africa, and S. America. The order is allied to *Campanulaceæ*, and *Lobeliaceæ*, but is destitute of their milky juice. The carolla is monopetalous, irregular. A remarkable character of this order is that the summit of the style bears a little cup, in the bottom of which the stigma is placed. The flowers of some of the species are of considerable beauty. The young leaves of *Scævola taccada* are used as a salad by the Malays; and the pith furnishes a kind of *rice-paper*, which they make into artificial flowers and other ornaments.

GOOD FRIDAY: Friday before Easter, observed in commemoration of the crucifixion of the Lord Jesus Christ. This day was kept as a day of mourning and of special prayer from a very early period. It was one of the two paschal days celebrated by the Christian Church, and in memory of the crucifixion, was called by the Greeks *Pascha Staurosimon*, or the 'Pasch of the Cross.' That it was observed as a day of rigid fast and of solemn and melancholy ceremonial, we learn from the 'Apostolic Constitutions' (b. v. c. 18), and from Eusebius (*Eccl. Hist.* ii. c. 17), who records also that, when Christianity was established in the empire, Constantine forbade the holding of law-courts, markets, and other public proceedings on this day. In the Rom. Cath. Church, the service is peculiar; instead of the ordinary mass, it consists of what is called the Mass of the Presanctified, the sacred host being consecrated not on Good Friday, but reserved from the preceding day. The priests and attendants are robed in black, in token of mourning; the altar is stripped of its ornaments; the kiss of peace is omitted, in detestation of the kiss of the traitor Judas; the priest recites a long series of prayers for all classes, orders, and ranks in the church, and even for heretics, schismatics, pagans, and Jews. But the most striking part of the ceremonial is the so-called 'adoration of the cross,' or, in the old English popular vocabulary, 'creeping to the cross.' A large crucifix is placed upon the altar with appropriate ceremonies, in memory of the awful event which the crucifix represents, and the entire congregation, beginning with the celebrant priest and his ministers, approach, and upon their knees reverently

kiss the figure of our crucified Lord. The very impressive office of 'Tenebræ' is held on Good Friday, as well as on the preceding two days: it consists of the matins and lauds of the office of Holy Saturday (the next day), and has this peculiarity, that at the close all the lights in the church are extinguished except one, which for a time (as a symbol of our Lord's death and burial) is hidden under the altar.

GOOD HOPE. See CAPE OF GOOD HOPE.

GOODKNIGHT, JAMES LINCOLN, American educator: b. Allen County, Ky., 1846, Aug. 24. He was graduated from Cumberland University (Lebanon, Tenn.) in 1871, from the Union Theological Seminary in 1879, studied also at Edinburgh and Jena, and was president of West Virginia University (Morgantown). From 1900 to 1904 he was president of Lincoln (Ill.) University. His articles have appeared in various periodicals.

GOOD'LAND, KANSAS, county-seat of Sherman co.; on the Chicago, R. I., & P. R.R. The manufactures are flour and machinery. The city contains railroad repair-shops and grain elevators, and is the centre of trade for a large agricultural region in which there are a number of cattle ranches. Pop. 1,120.

GOOD'MAN, EDWARD JOHN, English journalist and novelist: b. London, 1836, Dec. 19. He entered journalism in 1857 and has served on the editorial staffs of several prominent English journals, including the London *Daily Telegraph*. Besides *The Best Tour in Norway* (1891); *Wilson's Handbook to Norway* (1894); and *New Ground in Norway* (1896), he is the author of the novels *Too Curious* (1887); *Paid in His Own Coin* (1888); *His Other Self* (1889); *The Only Witness* (1891); *The Fate of Herbert Wayne* (1892); *The Night of the Fog* (1895).

GOOD'NOW, FRANK JOHNSON, American legal scholar: b. Brooklyn, N. Y., 1859, Jan. 18. He was graduated from Amherst College in 1879, from the Columbia Law School in 1882, studied also at the Paris Ecole Libre des Sciences Politiques and Berlin University, and was appointed to the chair of administrative law at Columbia in 1883. A recognized authority on municipal, administrative, and constitutional law, he published: *Municipal Home Rule* (1900); *Comparative Administrative Law* (1893); *Municipal Problems* (1897); *Politics and Administration* (1900); *City Government in the United States* (1904); *Selected Cases on the Law of Taxation*, Edited (1905), etc.

GOODRICH, CASPAR FREDERICK: American naval officer; b. 1847, Jan. 7; was appointed to the navy from Connecticut, 1861, Dec. 9; graduated at the U. S. Naval Academy at the head of his class, 1864; promoted master, 1866, Dec. 1; lieut. 1868, March 12; lieut.-commander, 1869, March 26; commander, 1884, Sept. 7; captain 1897, and rear admiral 1904, Feb. 17. He was naval attache on the staff of Lieut-Gen. Sir Garnet Wol-

seley during the Tel-el-Kebir campaign, 1882. In 1885 he served on the Endicott Fortifications Board, and in 1886-89 had charge of the Torpedo Station. He commanded the *Jamestown*, *Constellation*, and *Concord* in 1891-95. During the war with Spain he was in command of the auxiliary cruiser *St. Louis* and the protected cruiser *Newark*, later of the *Iowa* and the *Minneapolis*; commander of the Portsmouth Navy Yard 1903; and commander-in-chief of the Pacific Squadron 1905.

GOODRICH, *gûd'rĭj*, CHAUNCEY ALLEN, D.D.: 1790, Oct. 23—1860, Feb. 25; b. New Haven: lexicographer. He graduated at Yale College 1810, was tutor there 1812-14, studied theology, and was ordained pastor of the Congl. Church in Middletown 1816. After a year's service he resigned, was elected pres. of Williams College but declined 1820, was prof. of rhetoric in Yale College 1817-39, and of pastoral theology in Yale Divinity School from 1839 till his death. In 1814 he published a *Greek Grammar*, 1832 *Latin and Greek Lessons*, 1852 *Select British Eloquence*, 1829 established *Christian Quarterly Spectator*, and edited it till 1839, and from 1828 till his death was engaged in abridging, supplementing, and revising the dictionary published by Noah Webster, his father-in-law.

GOOD'RICH, SAMUEL GRISWOLD (*Peter Parley*): 1793, Aug. 19—1860, May 9; b. Ridgefield, Conn.: author After a year in foreign travel, he established himself in the publishing business in Hartford 1824, and Boston 1828. He edited *The Token*, an annual of exclusively American illustrations, poems, stories, and essays, 1828-42, and *Merry's Museum and Parley's Magazine* 1841-54, was a member of the Mass. senate 1838-9 and U. S. consul at Paris 1851-55, and while living abroad published in French *Les Etats Unis, aperçu statistique, historique, geographique, industriel, et social* (1852). Of nearly 200 separate vols. which he compiled, edited and wrote, 170 were issued under the pen-name 'Peter Parley,' which were of a juvenile and educational character, and were translated into several foreign languages.

GOODSELL, DANIEL AYRES: an American clergyman; b. in Newbury, N. Y., 1840, Nov. 5; was graduated at the University of the City of New York, 1859; became a minister of the Meth. Epis. Church, 1859; was editor of the *Christian Advocate*, New York, 1880-88. In the latter year he was elected bishop.

GOODSIR, *gûd'sĕr*, JOHN: 1814, Mar. 20—1867, Mar. 6; b. Anstruther, Fifeshire, Scotland: prof. of anat. in the Univ. of Edinburgh, 1846-67. He went through the literary course at St. Andrews Univ.; was apprenticed to a dentist in Edinburgh, and attended the medical classes there. In 1839 he published a striking essay on the teeth. For a time he assisted his father in practice, but in 1840 became conservator of the museum of the Royal College of Surgeons in Edinburgh;

and 1842-3, delivered courses of lectures on the diseases of bone and cartilage. He also investigated the minute structure of the healthy tissues, and was one of the first observers who strongly insisted on the general diffusion, throughout the animal textures, of the minute bodies called *nuclei*. His memoirs on secreting structures and on the human placenta were very important. Many of his physiological and pathological essays were published in a volume 1845. He published many valuable papers on comparative anatomy and natural history. In 1844, he was appointed assistant to Dr. Monro, prof. of anatomy in the Univ. of Edinburgh, and 1846 became his successor. His reputation as an anatomical teacher became very great and widely extended, and was maintained till ill-health overtook him near the close of his life. His views on the nucleated *cell* as the great agent in absorption, nutrition, and secretion, are now accepted as data in physiology. See *Memoir* by Prof. Turner (1868).

GOOD TEM'PLARS, Independent Order of: secret society whose members are required to subscribe to the following pledge: that they will not buy, sell, use, furnish, nor cause to be furnished to others, as a beverage, any spirituous or malt liquors, wine, or cider, and will discountenance the manufacture and sale thereof in all proper ways. The organization is divided into subordinate, grand (state), and supreme lodges; has a juvenile dept.; and is in operation in the United States, Canada, S. America, Africa, Australasia, the British Isles, Scandinavia, and Germany. The supreme lodge was organized in Syracuse, N. Y., 1852, with Nathaniel Curtis as the first R. W. G. T., and was reorganized at Cleveland, Ohio, under the title of the Right Worthy Grand Lodge of the World, I. O. G. T., 1855, with James M. Moore, as R. W. Good Templar. The Juvenile Dept. was organized at Baltimore under the name of the Cold Water Templars 1871, and the name was changed to Juvenile Templars 1874. The Order has certain mystic rites, secret signs, and pass words similar to Masonry, and an insignia peculiar to itself. It is largely social in its functions, especially in the smaller towns and villages, where it serves the purpose of a social club.

GOOD-WILL', in Law: popular expression rather than a legal term. It means that kind of interest which is sold together with any profession, trade, or business. In reality it is not the business that is sold, for that is not a distinct thing recognized by the law, but the house, shop, fixtures, etc., are sold, and the trade debts; and when transferring these, the seller binds himself, either by covenant or by agreement, to do everything properly in his power to recommend to his successor, and promote his interests in such business. If the seller acts contrary to such agreement, he is liable to an action. But the more usual course is for the seller to enter into an express covenant not to carry on the same busi-

ness within 30, 40, or 100 m. or some specified moderate distance from the place where the purchaser carries it on. At first, such a covenant was sought to be set aside as invalid, on the ground that it tended to restrain the natural liberty of trade; but the courts have established its validity, on the ground that if a definite radius of moderate length is fixed, it does not sensibly restrain trade, inasmuch as the person covenanting can go beyond those limits, and trade as much as he pleases. If the party break his covenant, he is liable to action for damages.

GOODWIN, J. CHEEVER, American dramatist: b. Boston 1850, July 14. He was graduated from Harvard in 1873, was a reporter on the Boston *Traveller* in 1873-4, and secretary to the comptroller of New York in 1886-91. His writings include verse in periodicals and many plays, among them some popular successes, such as *Evangeline*, *The Panjandrum*, *Wang*, *The Lion Tamer*, *Lost, Strayed, or Stolen*, and *The Monks of Malabar*.

GOODWIN, MAUD WILDER, American historical novelist: b. Ballston Spa, N. Y., 1856. She has published: *The Colonial Cavalier; The Head of a Hundred; White Aprons; An Historical Romance; Dolly Madison*, a biography; *Historic New York* (1898); *Sir Christopher; Flint; Claims and Counterclaims* (1900) etc; coeditor, *Four Roads to Paradise* (1904).

GOODWIN, NATHANIEL CARL, American actor: b. Boston 1857. His first appearance was made in *Law in New York* at the Howard Athenæum, Boston, and subsequently he became known in burlesque and light comedy. Among the dramas which he has since presented are: *A Gilded Fool; In Mizzoura; An American Citizen;* his chief success, *Nathan Hale; The Altar of Friendship; Shylock* in Shakespeare's *Merchant of Venice; The Cowboy and the Lady* (1899); *When We Were Twenty-one* (1900); *The Altar of Friendship* (1901); *The Usurper* (1903); *A Midsummer Night's Dream* (1904); *The Beauty and the Barge; Wolfville;* and *The Genius* (1905-6).

GOOD'WIN, THOMAS, D.D., 1600, Oct. 5—1679, Feb. 23; b. Rollesby, Norfolk, England: Independent minister. He received the degree B.A. at Christ's College, Cambridge 1616, was chosen a fellow of St. Catharine's Hall 1620, was licensed a univ. preacher 1625, and was appointed by the king as vicar of Trinity Church 1632. Two years afterward he resigned all his offices and left the univ. because of interferences by his ecclesiastical superior, and after spending some time in London became pastor of a congregation of English refugees at Arnheim, Holland, 1639. When the long parliament impeached Abp. Laud, Goodwin returned to London and took charge of an independent congregation, attaining notable eminence as a preacher. In 1643 he was selected a member

of the Westminster assembly and there allied himself with the Congl. party or 'Dissenting Brethren.' He was a man of great learning, and was frequently appointed to preach before the house of commons, by whose order his chief sermons were printed, and by whom he was appointed pres. of Magdalen College, Oxford, which office he held till the restoration of Charles. He became an intimate adviser of Oliver Cromwell, and from 1660 till his death applied himself to theological study and the care of a small congregation in London.

GOODWIN, William Watson, American Greek scholar: b. Concord, Mass., 1831, May 9. He was graduated at Harvard College in 1851; and was Eliot professor of Greek there 1860–1901. He published: *Syntax of the Moods and Tenses of the Greek Verb; Greek Grammar;* and a revised translation of *Plutarch's Morals* (1871).

GOOD'WIN SANDS: famous banks of shifting sands, stretching more than 10 m. n.e. and s.w. at an average of 5½ m. off the e. coast of Kent, England. The sands are divided into two portions by a narrow channel, and at low water, many parts are uncovered. When the tide recedes, the sand becomes firm and safe; but after the ebb ceases the water permeates through the mass, rendering the whole pulpy and treacherous, in which condition it shifts to such a degree as to render charts uncertain from year to year. The northern portion is of triangular form—3½ m. long, 2½ in greatest width; on the northernmost extremity, known as the North Sand Head, a light-vessel (revolving light) abt. seven m. from Ramsgate, marks the entrance on this perilous shoal. In the centre, on the w. side, jutting out toward the shore, is the Bunt Head, a peculiarly dangerous portion, also marked by a light-ship (revolving light). The southern portion is 10 m. in length, 2½ in width at its n. end, sloping toward the s.w., to a point called South Sand Head, also marked by a light-vessel (fixed light). A fourth (revolving green) was added 1874, on the e. side, making four lights; nine buoys also surround the Sands.

From the sunken position of these sands, they have always been dangerous to vessels passing through the Straits of Dover. On the other hand, they serve as a breakwater to form a secure anchorage in the Downs (q.v.) during easterly or south-easterly winds. The Downs, though safe under these circumstances, become dangerous when the wind blows strongly off-shore, at which time ships are liable to drag their anchors, and to strand upon the perfidious Goodwins, where their wrecks are soon entirely swallowed up. Many celebrated wrecks have taken place here, the most terrible having been the loss of an entire fleet of 13 men-of-war, in 1703 on the night of Nov. 26, on the Sands

and neighboring shores. In two of these, the *Mary* and the *Restoration*, every soul perished, and 1,200 officers and men were lost altogether. 1805, Dec., here foundered the *Aurora*, a transport, when 300 perished; 1814, Dec., the *British Queen*, Ostend packet, was lost with all hands; and 1857, Jan., the mail-steamer *Violet* was destroyed. The greatest dangers are in the winter months.

These dangerous sands are said to have once been a low fertile island called Lomea (*Infera Insula* of the Romans), belonging to Earl Godwin, where he lived and kept his fleets; but in 1014, and again 1099, it was overwhelmed by a sudden inundation of the sea, which did great damage also in other parts of Europe. At the period of the Conquest by William of Normandy, these estates were taken from Earl Godwin's son, and bestowed on the abbey of St. Augustine at Canterbury. The abbot having diverted the funds with which the island should have been maintained against the sea, to the building of Tenterden steeple, allowed the sea-wall to become dilapidated; and in 1099, the waves rushed in, and overwhelmed the whole. Thus, 'Tenterden steeple was the cause of the Goodwin Sands'; so, at least, says one of the many legends connected with these remarkable shoals.

As a precaution, now, in foggy weather, bells or foghorns in the light-ships are frequently sounded. Difficulty is experienced in finding firm anchorage for these vessels; and all efforts to establish a light-house have been unsuccessful. In 1840, a beacon was erected by Admiral Bullock, which stood for many years, and another 1847 on piles of iron screwed into the sand, but this was washed away two months afterward. As soon as a vessel is known to have been driven on the sands, signal rockets are thrown up and guns are fired from the light-vessels, when one or other of the four life boats from Ramsgate, Deal, Walmer, or Kingsdown, immediately launch to the rescue, followed usually by 'hovellers,' boats. These 'hovellers,' as the boatmen of East Kent are called, though in fine weather they appear to lead an inactive life, show, in tempest and danger, a praiseworthy intrepidity.

GOODYEAR, Charles: 1800, Dec. 29—1860, July 1; b. New Haven, Conn.: American inventor. At the age of 21 he went into business in Philadelphia. Having failed as an iron manufacturer 1830 he began to experiment on the uses of india-rubber; and he expended all his means, and reduced his family to destitution, in experiments with various mixtures and processes, the most successful of which were with magnesia, lime, and nitric acid, to make it available for water-proof shoes, clothing, etc. His efforts were a series of failures, excepting a partial success in treating the surface of rubber goods with nitric acid, until he bought of one Hayward, a rival experimenter, an invention for mixing

india-rubber with sulphur. The great secret of vulcanization, in which the two substances, subjected to a high temperature, are converted into the elastic, enduring, and heat and cold-defying fabrics now in use, was an accidental discovery, made while standing by a stove, and idly subjecting a mixture of rubber and sulphur to its heat. This new product he patiently perfected, discovering new uses to which it could be applied, until it required 60 patents to secure his inventions. Some of these rights were secured by other persons in England, and in France they were forfeited by an informality; for this reason and because of expensive law-suits, he failed to receive much pecuniary profit from his discovery.

GOOKIN, *gûk'ĭn*, DANIEL: 1612—1687, Mar. 19; b. Kent, England: soldier. He accompanied his father's family to Va. 1621; successfully defended the family plantation during the Indian massacre 1622; removed to Cambridge, Mass.; affiliated with the Puritans, and became a militia cap. 1644; was elected member of the Mass. house of deputies, speaker 1651, and magistrate 1652; and from 1656 till his death was supt. of all Indians owing allegiance to Mass. He co-operated with John Eliot in protecting and educating the Indians, visited Oliver Cromwell by invitation 1656-7, returned in the ship with the regicides whom he aided in concealing 1600, was appointed maj.-gen. of the Mass. colony 1681, and was author of *Historical Collections of the Indians of Massachusetts* (pub. by the Mass. Hist. Soc. 1792), and a *History of New England* (lost).

GOOLE, *gôl*: thriving town and river-port of England, in the W. Riding of Yorkshire, on the Ouse, at its junction with the Don or Dutch river, 22 m. s.s.e. of York. The tract on which it stands, and by which it is surrounded, originally a swamp, has been industriously reclaimed and is a rich agricultural district. It has four docks in addition to the Goole canal, also used for vessels; ponds for bonded timber, one of them capable of floating 3,000 loads, a large graving-dock; and extensive warehouse accommodation. About £100,000 worth of oil has been stored here at one time. Between 20 and 30 steamers leave the port weekly for Continental ports. Goole is a terminus of the Lancashire and Yorkshire railway, and by it the Aire and Calder Navigation have extensive water-carriage. More canal boats ply to and from Goole than to and from any other place in the kingdom except Runcorn. Among imports are shoddy for manufacturing purposes, oil, log-wood, timber, champagne, farm-produce and groceries. Coal, cloth, and machinery are among the chief exports. There are iron-foundries, alum and manure works, and corn-mills; ship and boat-building, sail-making, and agricultural machine-making are also extensively carried on. St. John's Church is a large handsome edifice, dating from 1848; there are several Dissenting chapels and a Rom. Catholic chapel. Pop. about 16,000.

GOOR. See DZIGGETHAI.

GOORKHAS. See GORKHA.

GOOROO, n. *gô-rô'* [Hind. *gûrû*]: among the *Hindoos*, a spiritual guide.

GOOSANDER, *gôs'an-der* (*Mergus Merganser*): web-footed bird of the same genus with those commonly called Mergansers (q.v.), and one of the large species. It is larger than a wild duck; the adult male has the head and upper part of the neck of a rich shining green; the feathers of the crown and back of the head elongated, the back black and gray, the wings black and white, the breast and belly of delicate reddish buff color. The female has the head reddish brown, with a less decided tuft than the male, and much grayer plumage, and has been often described as a different species, receiving the English name of *Dundiver*. Both mandibles are furnished with many sharp serratures or teeth directed backwards, the nearest approach to true teeth found in the mouth of any bird. (See also BILL.) The Goosander is a native of the arctic regions, extending into the temperate parts of Europe, Asia, and America. In severe winter weather, the females and young migrate southward more frequently than the old males. It feeds on fish, crustaceans, and other aquatic animals which its serrated bill and its power of diving admirably adapt it for seizing. The flesh of the goosander is extremely rank and coarse, but the eggs appear to be sought after by the inhabitants of some northern countries.

GOOSE, n. *gós* [AS. *gos;* Low Ger. *goos;* Dan. *gaas;* Icel. *gás;* Pol. *ges*, a goose: Lith. *guz, guz*, cry to call geese]: a well-known web-footed bird; a silly person; a tailor's smoothing-iron. GEESE, n. plu. *gēs*. GOOS'ERY, n. *-ėr-ĭ*, a place for geese; folly. GOOSE-FOOT, *a native* plant, so called from the shape of the leaf, forming several species of *Chenopōdĭŭm*. GOOSE-GRASS, or CLEAVERS: see under CLEAVE. GOOSE-QUILL, a quill from a goose's wing, used for writing with. TO COOK ONE'S GOOSE in *familiar language*, to do for one in the sense of cheating, befooling, or getting the better of. GREEN-GOOSE, a goose less than four months old.

GOOSE (*Anser*): genus of large, web-footed birds, usually classed as water-fowl and belonging to the same family, *Anatidæ*, as the duck and swan. The bill is large, but not long, high and broad with the upper mandible slightly curved at the tip. The legs are short and placed well forward, the neck rather long, and the wings large and powerful. Although an expert swimmer and diver the goose remains a large part of the time upon land, and can be successsfully reared if only sufficient water for drinking purposes is provided, though free access to a pond or stream is always desirable.

Under the general term of Wild Geese several varieties are included. Of these one of the most common in the old world is the Gray-legged Goose (*A ferus*),

often called the Gray Lag Goose. By some naturalists this is supposed to be the parent stock of the domestic goose, but the claim can hardly be sustained. It is not found in America. Among its characteristics are a marked preference for a comparatively mild climate, and a habit of visiting cultivated fields in the early spring, and seriously injuring the tender plants. This variety was formerly found in immense flocks in England, but the drainage, during the present century, of the great fens which had served as their breeding grounds has greatly diminished their numbers. The Bean Goose (*A. Segetum*) closely resembles the preceding, but has somewhat darker plumage, a smaller and orange-colored bill, and longer wings. Vast numbers are found in n. Europe, Asia, and America. It visits warmer regions in winter, and often does great damage to wheat-fields in England and Scotland, and is destructive also to beans and peas. The White Fronted Goose (*A. albifrons*) is very small, with gray plumage and a peculiar white spot on the forehead: it breeds in the Arctic regions, but visits warmer latitudes in winter. It appears in large flocks, and chooses marshes rather than cultivated districts. The Snow Goose (*A. hyperboreus*) has its home in the Arctic regions: it is found in the largest numbers in America, and in winter migrates to the southern portion of the United States. It is of small size, has white plumage, and is highly prized for both its flesh and its feathers. The Canada Goose (*A. Canadensis*) is found in vast numbers in N. America. It has also been long naturalized in Great Britain, and is one of the most beautiful varieties. On account of a peculiar white patch on the throat it is often called the Cravat Goose. It is easily tamed, and its flesh is highly esteemed. There are several other varieties of the wild goose, which differ only in minor points from those above noted. Wild geese when migrating fly in wedge-shaped lines, closely following the leader, and keep up a peculiar cackling which can be heard for a long distance.

The goose is easily domesticated, and in this condition has been known from a very early period. Hierogylphics show that it was largely kept and greatly prized by the ancient Egyptians. The Romans and other nations of an early period of civilization also gave considerable attention to its breeding and management. From early times it has been prized for its flesh and hardly less for its feathers. Before the invention of steel-pens the quills of the goose were in almost universal use for writing, and they are still to be found in large stationery stores. The feathers are of superior quality, and always find ready market. Though not so highly prized here as in Europe, the flesh of the goose is used to a considerable extent, and is growing in popularity. It is in special demand at the Christmas season. A remarkable peculiarity of the goose is seen in the fact

that although it grows very rapidly and matures early, it lives to an advanced age. There are many well attested cases of life prolonged to 40 or 50 years, and in some instances a much greater age has undoubtedly been attained.

It is desirable that geese should have a wide range. They thrive better, and can be raised much cheaper than if kept in close quarters. A house should be provided for shelter at night and during the winter. About 2 sq. ft. of room should be allowed for each bird. The roosts should be low, the floor dry, and the room should be kept clean. Nests may be made in large boxes placed against the sides of the building in which the geese are kept. A gander must be kept for four or five geese; and many breeders prefer to keep the birds in pairs. The number of eggs laid in a year varies greatly with the breed and the care which the birds receive, but may be said to range from 40 to 60. Unlike the hen the goose becomes a more prolific layer as it reaches maturity. It is also a much better breeder when two or three years old than at an earlier age: some breeds are said not to pair until they reach this age. The best period for hatching is from the middle of April to the middle of July, but if properly cared for later ones do well. Fifteen eggs are enough for one sitting. The period of incubation is about four weeks, varying slightly with the temperature. The nest should be deep, and food and water should be placed near it, in order that the goose may not be obliged to leave it and risk the spoiling of the eggs by their becoming chilled during her absence. If they hatch unevenly, the goslings that first break their shells may be removed from the nest in order that the goose may be contented to remain until the others are out. Many breeders prefer to place the eggs under a hen; others favor artificial incubation. Goslings should not be fed until they have been hatched about 24 hours. They may then be kept on eggs boiled hard and chopped very fine, boiled potatoes, bread soaked in milk, green grass, lettuce, or clover. A little Indian meal may be given, but it should be thoroughly cooked. As they grow older they can be allowed to forage largely for themselves, though they should be regularly provided with food at their houses. Until three weeks old they should not be allowed to go into water, and for a much longer time they should be kept from exposure to storms and from roaming in wet grass. They ought also be regularly housed at night. Geese should always be given plenty of green grass in summer, and in winter should have, in addition to grain, scraps of meat, turnips and cabbage chopped fine, and boiled potatoes. If kept in clean quarters and properly fed, the goose will not suffer from disease. When caring for their young, geese are inclined to be quarrelsome and should be kept from other poultry, as at such times they often destroy chickens and young turkeys. Geese

should be fattened when not more than a year old. If well fed during the summer they can be made very fat by feeding, for a few weeks in the fall, all the cooked Indian meal and boiled potatoes that they will eat. Geese are very social birds, and fatten more readily when several are kept together than when alone. The celebrated *pâtè de foie gras* is made from the enlarged livers of geese which have been kept in close and warm quarters, and stuffed with rich food.

Though the goose has been long domesticated there are comparatively few distinct breeds. Of these the Toulouse is one of the largest and best. The birds are hardy, and after the first year are good layers. When three years old and well fattened, they weigh 40 to 60 lbs. per pair. The Embden is nearly as large as the Toulouse, and is by some considered even more valuable. The Chinese geese are handsome, hardy, and good layers. The African and the Egyptian breeds are not common in the United States. The former is sometimes recommended for its value as food, etc., and the latter for its beauty. The Canada, or Wild Goose, is large, readily domesticated, and breeds freely with ordinary varieties.

GOOSEBERRY, n. *gŭz'bĕr-rĭ* [Ger. *krausel-beere*, or *kraus-beere*—from *kraus*, crisp: Dut. *kroesen*, to curl—probably from the upright hairs which cover the fruit: OF. *groiselle;* Gael. *groiseid*, a gooseberry]: the well-known fruit of a prickly shrub; the fruit or the many varieties of the *Rībēs grossŭlārĭă*, ord. *Grossŭlārĭācĕœ* or *Ribēsĭācĕœ*. GOOSEBERRY-FOOL, gooseberries stewed or scalded, pounded with cream, and sweetened.

GOOSEBERRY (*Grossularia*): fruit-bearing shrub with thorny and prickly stems, small leaves, green flowers, bell-shaped calyx, and producing large berries; closely related to the currant (q.v.). It is a native of Europe, Asia, and N. America, and is often found growing wild, especially in mountainous regions. The domestic gooseberry (*Ribes grossularia*) is highly cultivated and very popular in England, where the cool, moist climate is favorable to its development to a high degree of perfection. In the United States the hot, dry summers render it liable to mildew, and it has never been largely grown. New, and more hardy varieties have recently been introduced, and interest in their cultivation is increasing. Plants should be set in rows about six ft. apart, and the plants four ft. apart in the row. The land should be rich and moist, but if naturally wet should be thoroughly underdrained. No weeds or grass should be allowed to grow in the plot devoted to this fruit. Fertilizers should be liberally applied each spring, and soil should be thoroughly stirred with a cultivator several times during the season. The third year from planting, a good crop of fruit should be produced, and the plants should remain productive at least 20 years. If planted in a partially shaded position, the tendency to mildew is diminished. Mulch-

ing also acts as a preventive of this disease, and serves the additional purpose of mitigating the injurious effects of drought. As young wood yields the largest and finest fruit, the removal of old and weak stems is required. If the plants are a proper distance apart no other pruning will be needed, except in case of very rank growth, when the new wood may be shortened. If they are crowded, it may be necessary to remove part of the vigorous stalks. In ornamental gardens, the gooseberry is often pruned in tree form, but this requires more labor than is needed for the natural bush form, and, except in appearance, secures no advantage. Propagation is easily effected by cuttings, and by layers. The former are usually preferred. They should be taken from new wood about Sep. 1. They should be about six inches in length, and immediately planted in a rich, moist soil down to the eye nearest the top. They should be placed about two inches apart, and the soil packed around them as closely as possible. Before cold weather comes they should be well mulched to prevent injury by frost. Cuttings can be grown in the spring, but they do not make as vigorous plants as those started in the fall. The gooseberry is principally used in a green state. Although it is very fine in quality and appearance, there is very little demand for the ripened fruit. The berries make excellent sauce, and if cooked just enough to burst the skins, and then put in ordinary fruit jars, they can be kept for an indefinite period. Sugar should not be added until the fruit is wanted for use. The green berries are largely used for pies and tarts. If care is taken that no bruised or imperfect specimens are put in, the green fruits can be kept, for a year at least, in ordinary bottles. The bottles should be nearly filled with berries, and the remaining space filled with pure water. Cork tightly, and keep in a cool cellar. It is not necessary to either heat the water or seal the bottles. The number of varieties which are really good, and which thrive in this country, is quite small. Most of the sorts in high repute in England suffer so much from mildew as to be worthless here. Probably the Houghton seedling is the most widey cultivated. It is vigorous, hardy, and productive and yields a good quality of fruit. The Downing is a strong grower, very prolific, and is not liable to mildew. Smith's Improved has the advantage of a thin skin; the berries are large, and of excellent quality. The Industry is by far the most promising of the foreign varieties yet introduced; it is a vigorous grower, remarkably prolific and the fruit is large and of excellent flavor. If it endures the climate it will prove a great acquisition.

GOOSE'BERRY, COROMANDEL. See CARAMBOLA.

GOOSE'BERRY, PERUVIAN. See PHYSALIS.

GOOSEBERRY CATERPILLAR, (*Nematus ventri-*

cosus) : insect pest which infests both the gooseberry and the currant, and quickly destroys the leaves. It is a native of Europe, and was brought to this country from Canada 1857. The eggs are laid on the under side of the leaves, and the leaves nearest to the ground are usually chosen. The process of hatching occupies but a few days, and the worms soon commence their ravage. A second lot appears about the time the fruit is grown, and by removing the leaves prevent its ripening. Until recently the application of powdered hellebore has been the standard remedy. It is sprinkled upon the affected leaves when they are wet with dew. If removed by rain another application will be required. It is an active poison, and should be used with care. Of late, Pyrethrum powder has been used as a substitute for hellebore. It is said to be equally efficient, and it can be used freely and safely even when the fruit is ripening. It should be sprinkled over the leaves at night. Any remedy, in order to be serviceable, must be applied as soon as the first worms appear.

GOOSE-FISH. See ANGLER.

GOOSE LAKE: lake w. of the Warner Mts., in Jackson co., Or., and Siskiyou co., Cal.; intersected by the boundary line of those states; 30 m. long, 10m. wide. Authorities differ as to the flow of its water, some claiming an outlet through Pitt river at the s. end, others that it has no outlet.

GOOSE-NECK: a bent pipe of brass, or iron, employed to connect the front end of the feed-pipe with the lower chamber of the pump.

GOPHER, n. *gō'fer* [F. *gaufre*, a honeycomb]: popular name of various burrowing animals. In the United States the word Gopher is applied to a species of rodents of the genera *Geomys* and *Thomomys*, sometimes called salamanders; to *Testudo polyphemus*, large land tortoise; to species of the rodent genus *Spermophilus*, locally known in Ill. as prairie squirrels; to the sub-family *Geomyinæ*, or pouched rats; and in Ga. to the colubroid snake. Among these there is but a single feature in common, the habit of burrowing into the earth for places of habitation and for secretion of food. To understand which of these species is meant in reading or conversation, it is essential to know in what part of the country the gopher indicated is a habitant. The pouched gopher is confined to N. America and almost exclusively to the region w. of the Miss. river. It is nocturnal, has a clumsy body, large claws on the fore feet for digging, and derives its name from the largely distended and overhanging or pouching cheeks. It averages 9 inches in length and 14 ounces in weight. In some portions of the west they are known as muloes (earth mice). The salamanders of the south, particularly of Ga., also known as hamsters, are larger than the pouched gopher, have longer fore than hind feet, and have similar bur-

rowing claws. The genus *Spermoyphilus*, some species of which are known in Ill. and Cal. as prairie squirrels, and in n. Ill., Io., Wis., and Minn. as gophers, comprises a beautifully striped creature, 6 inches long, with a tail 4 inches long, in the Ill. region; and a mottled one, 11 inches long with a tail 8 inches long, in Cal. Both belong to the marmot family, and between them and the true marmots is another species known as prairie dogs, about 13 inches long and with tails of 4 inches. They bear no resemblance to a dog, but when frightened or at play among themselves make a chattering noise like a small dog. Though almost the shyest of all animals, they share their shallow domiciles with burrowing owls and rattlesnakes. The prairie squirrels and prairie dogs are very annoying to farmers and horticulturists. See Prof. Baird's *Report of the Pacific Railroad Expeditions*, VIII.; Kendall's *Narrative of the Santa Fé Expedition.*

GOPHER: burrowing land tortoise, genus *Testudo*, found in the s. states from the Savannah river to Fla. It is nocturnal, abounds chiefly in forests, but frequently makes its domicile in open fields, especially where potatoes, its favorite food, are cultivated. Its shell is from 13 to 14 inches in extreme length, oblong, remarkably compressed, grooved, and of a yellow-brown color. It is credited with enormous strength, for a creature of its size, and Dumeril and Bribon assert that it can move along comfortably with a man on its back. It burrows very deep, and its flesh and eggs are locally prized as food.

GOPHER WOOD, *gō'fėr wûd* [Heb. *gopher*]: wood of a tree not certainly identified: mentioned in Scripture as used in building Noah's ark. Its identity with the Cypress (q.v.) is maintained partly on account of the qualities of the wood, and partly on account of the agreement of the radical consonants of the names.

GORAKHPUR, or GORUCKPORE, *go-rūk-pör:* dist. of the N. W. Provinces, India; bounded n. by Nepaul, e. by Champâran and Sâran, s. by the Gogra river, w. by Basti and Fyzabad; lat. 26° 50′ 15″—27° 28′ 48″ n., long. 83° 7′—84° 29′ e. 4,578 sq. m.; cap. Gorakhpur. Its surface in general is level, dense forests abound in the n. and centre, and excepting at the foot of the Himalayas, which is bordered by a marshy tract of unhealthful jungle, most of the dist. is very fertile and well cultivated. Gorakhpur is drained by the Rapti, Gogra, great and little Gandak, Kânua, Rolim, Ami, and Gunghi rivers, and there are numerous lakes well stocked with fish. The chief products are cotton, rice, and a variety of foodstuffs, and a commerce is confined to those articles. The founder of the Buddhist religion died in the dist. of Gorakhpur, which thus became the headquarters of the new creed. For many centuries it was the scene of continual strife. It was included in the territory

ceded by Oudh to the British under the treaty of 1801, seized by the rebels during the great mutiny, regained by friendly Gurkhas, and again passed under British rule. Pop. about 2,750,000, nine-tenths Hindus.

GORAL, *gōr'al* (*Antilope Goral*, or *Nemorhedus Goral*): animal of the antelope family, inhabiting in large herds the elevated plains of Nepaul. It is of a grayish-brown color, dotted with black, the cheeks white; the hair is short; the horns are short, inclined, recurved, and pointed. It is wild and fleet, and when pursued, takes refuge in rocky heights. Its flesh is highly esteemed.

GORAMY, *gōr'a-mī*, or GOURAMI, *gôr'a-mē* (*Osphromenus olfax*): fish of the family *Anabasidæ* or *Labyrinthibranchidæ*, native of China and the Eastern archipelago, highly esteemed for the table, and on that account introduced into Mauritius, Cayenne, and the French W. India Islands. Its form is deep in proportion to its length, the head small, and terminating in a rather sharp short snout, the mouth small, the tail rounded, the dorsal and anal fins having numerous rather short spines, the first ray of the ventral fins extending into a very long filament. It is sometimes kept in large jars by the Dutch residents in Java, and fed on water-plants. It was introduced into Mauritius about the middle of the 18th c., and soon spread from the tanks in which at first it was kept into the streams, multiplying abundantly. This success is an encouragement to other attempts. The goramy is interesting on other accounts. It is one of the nest-building fishes, and at the breeding season forms its nest by entangling the stems and leaves of aquatic grasses. Both the male and female watch the nest for a month or more with vigilance, and violently drive away every other fish which approaches, till the spawn is hatched, afterward affording a similar parental protection to the young fry.

GORBELLIED, a. *gŏr-bĕl'ĭd* [Eng. *gore*, clotted blood, filth, and belly: Gael. *gaor*, to cram, to glut; *gaorran*, a big belly: comp. prov. Sw. *gar-balg*, a fat paunch]: in OE., having a fat belly. GORCROW, n. *gōr'krō* [Eng. *crow*]: the common or carrion crow.

GORCUM. See GORKUM.

GORDIAN-KNOT, *gawr'dĭ-an-nŏt:* Gordius, Phrygian peasant, was plowing in his fields, when an eagle settled on his yoke of oxen, and remained till the labor of the day was over. He sought an explanation of so wonderful a phenomenon, and was informed by a prophetess of Telmissus that he should offer sacrifice to Zeus. He did so; and then married the prophetess, by whom he had a son, the famous Midas. When Midas grew up, disturbances broke out in Phrygia, and the people sent messengers to the oracle at Delphi, to ask about choosing a new king. The messengers were informed that a

king would come to them riding on a car, and that he would restore peace. Returning to Phrygia, they announced these things, and while the people were talking about them, Gordius, with his father, opportunely arrived in the requisite manner. He was immediately elected king, whereupon he dedicated his car and yoke to Zeus, in the acropolis of a Gordium (a city named after himself, in Bithynia, not far from the river Sangarius), tying the knot of the yoke in so skilful a manner, that an oracle declared whoever should unloose it would be ruler of Asia. When Alexander the Great came to Gordium, he cut the knot in two with his sword, and applied the prophecy to himself. Hence, a Gordian-Knot denotes any inextricable difficulty or problem: *to cut the Gordian-Knot*, to solve or overcome a difficulty in a bold decisive manner.

GORDIANUS, *gawr-dĭ-ā'nŭs*, or GORDIAN: name of three Roman emperors, father, son, and grandson.

The first MARCUS ANTONIUS AFRICANUS GORDIANUS, was grandson of Annius Severus, and was descended by the father's side from the famous family of the Gracchi. He was remarkable for his attachment to literary pursuits. After being ædile, in which capacity he celebrated the gladiatorial sports with great magnificence, he twice filled the office of consul, first as the colleague of Caracalla, A.D., 213; second, as the colleague of Alexander Severus. Soon afterward, he was appointed proconsul to Africa, where he gained the affections and esteem of the people by his modest and gentle manners, his splendid liberality, and his refined literary taste; his old age was spent in the study of Plato, Aristotle, Cicero, and Virgil.—The tyranny and injustice of Emperor Maximinus having at length excited a rebellion against his authority in Africa, the imperial procurator there was murdered by a band of nobles who had formed a conspiracy against him on account of his cruelty. Gordianus, now in his 80th year, was proclaimed emperor, after having vainly refused the dangerous honor. He received the title of *Africanus*, and his son was conjoined with him in the exercise of imperial duty. The Roman senate acknowledged both, and proclaimed Maximinius, then absent in Pannonia, an enemy to his country. The younger Gordianus, however, was defeated in battle by Capellianus, viceroy of Mauritania, before Carthage, and his father, in an agony of grief, killed himself, having been emperor for 36 days. In his personal appearance, Gordianus is said to have greatly resembled Augustus.

MARCUS ANTONIUS GORDIANUS PIUS, grandson of the preceding, was raised to the dignity of Cæsar, with Pupienus, Maximus, and Balbinus, who also were elected emperors in opposition to Maximinus; and, in the same year, after the other imperial claimants had fallen by the hands of their own soldiers. Marcus Antonius Gordianus, then a boy 13 years of age, was elevated by

the Prætorian bands to the rank of Augustus. Assisted by his father-in-law, Misitheus, a man distinguished for wisdom, virtue, and courage, whom he made prefect of the Prætorians, he marched, in 242, into Asia, against the Persians, who, under Shahpûr (Sapor), had taken possession of Mesopotamia, and had advanced into Syria. Antioch, threatened by them, was relieved by Gordianus, the Persians were obliged to withdraw from Syria beyond the Euphrates, and Gordianus was just about to march into their country, when Misitheus died, and the young emperor lost his main prop. Philip the Arabian, who succeeded Misitheus, stirred up dissatisfaction in the army against Gordianus by the foulest treachery, and finally goaded on the ignorant and passionate soldiery to assassinate the emperor, 244. But knowing the great affection which the Roman people had for the gallant and amiable Gordianus, he declared in his dispatch to the senate that the latter had died a natural death, and that he himself had been unanimously chosen to succeed him.

GORDIUS, *gawr'dĭ-ŭs*: genus of *Annelida*, of the very simplest structure; very much elongated and thread-like, with no greater marks of articulation than slight traverse folds, no feet, no gills, no tentacles, though there is a knotted nervous cord. The mouth is a mere pore at one end of the animal; the other end or tail is slightly bifid, and has been often mistaken for the head. The species inhabit moist situations, are sometimes found on leaves of plants, but more frequently in stagnant pools, and in mud or soft clay, through which they work their way with great ease. They often twist themselves into complex knots, whence their name, gordius, from the celebrated *Gordian-knot*—and many of them are sometimes found thus twisted together; but they are often found also extended in the water. Of one species, gordius *aquaticus*, the popular name is Hair Eel; and a notion still prevails in many places that it is nothing else than a horse-hair, which has somehow acquired life by long immersion in water, and which is destined in due course of time to become an eel of the ordinary kind and dimensions; in proof of all which many an honest observer is ready to present himself as an eye-witness who has often seen these very slender eels in his walks. A popular notion prevails in Sweden, that the bite of the gordius causes whitlow. When the pools in which the gordius lives are dried up, it becomes shrivelled, and apparently lifeless, but revives on the application of moisture.

GORDON, *gawr'don*, Adoniram Judson, D.D.: Bapt. minister: b. New Hampton, N. H., 1836, Apr. 19., d. 1895, Feb. 2. He graduated at Brown Univ. 1860, and Newton Theol. Seminary 1863; was ordained pastor of a Bapt. church in Jamaica Plain, Mass., 1863, and of the Clarendon Street Bapt. Church in Boston 1869; published *Grace and Glory* (1880), *In Christ* (1872), *Min-*

istry of Healing (1882); *Two-fold Life* (1884); was one of the compilers of the *Service of Song* (hymns); and received the degree D.D. from Brown Univ. 1877.

GORDON, *gawr'don*, CHARLES GEORGE ('Chinese Gordon'—'Gordon Pasha'): 1833, Jan. 28—1885, Jan. 26. b. Woolwich, England; of Scottish ancestry. From school at Taunton he passed in 1847 to the Woolwich Military Acad., 1852 entered the Engineers, and after two years' desk-work at Pembroke, spent eight months in the Sebastopol trenches (1855). 1856-58 he was laying down the new Russo-Turkish frontiers in Bessarabia and Armenia; and 1860 he sailed for China, in time to be present at the surrender of Pekin, and the burning of the Summer Palace. In the service of China herself, he commanded the 'Ever Victorious Army,' a native force 3,000 to 5,000 strong, with 150 European officers, which, under him, in a 16 months' campaign (1863-64), suppressed the rebellious Tae-Pings (q.v.), taking four cities and a dozen minor strong places, and repeatedly routing an enemy at least 15 times stronger than itself. Gordon himself went always unarmed, except for a cane (his 'wand of victory'), and, never but once being wounded, was thought to bear a charmed life. China he left as poor as he had entered it, but with its highest military title, a Yellow Jacket, and a Peacock's Feather; his own country created him a C.B., and a lieut.-colonel. In 1865-71 he was working at Gravesend on the Thames defenses, and on the schooling of little Thames 'mud larks;' he was British commissioner on the Danube at Galatz (1871-73); next in Egypt's service, he toiled and strove to put down slave-hunting in the Soudan, and made the people love him (1874-79). In 1880 he sailed for India as private sec. with Lord Ripon, but gave up the post on reaching Bombay, and went straight on to China, which his wise counsels saved from going to war with Russia. Chief engineer in Mauritius, with the rank now of maj.gen. (1881-82), he wasted five months of the latter year in s. Africa, failing, through any one's fault but his own, to settle the Basuto difficulty. After a well-earned holiday in Palestine, he had just undertaken for the king of the Belgians an anti-slavery expedition to the Congo, when, 1884, Jan. 18, the British govt. dispatched him to Khartoum, to extricate the Egyptian garrisons in the Soudan, then menaced by a revolt of the Mahdi. He started by that night's mail, and reached Khartoum Feb. 18, having crossed the desert almost alone. For a while he seemed to be working, he did work, wonders toward the peaceful attainment of his difficult mission; its greatest difficulty being that he was neither told how he should act, nor allowed to act for himself. In March he commenced the heroic nine months' defense of Khartoum with miserable troops against the wild hordes that taxed the manhood of England's bravest veterans; in 1885, Jan 28, the van of Lord Wolseley's rescue expedition reached Khartoum on Gordon's own steamers, to find that it had fallen two

days earlier, and that Gordon was with the slain. Such was the end of 'Chinese Gordon'—'knight without fear and reproach,' the Sir Galahad, of the 19th century. See Andrew Wilson's *Ever Victorious Army* (1868); Birkbeck Hill's *Gordon in Central Africa* (1881); Gordon's own *Reflections in Palestine* (1884), and *Last Journals* (1885); and the Lives by Hake (2 vols. 1884-5), by Archibald Forbes (1884), and by Gordon's brother, Sir Henry Gordon (1886).

GORDON, Charles William (Ralph Connor) Canadian author: b. Glengarry, Ont., 1860. Graduated from Toronto University 1883 and after ordination was a missionary in the West; appointed pastor of West End Presbyterian church, Winnipeg, 1893. His works include: *Black Rock; A Tale of the Selkirks* (1898); *The Sky-Pilot: A Tale of the Foothills* (1899); *Beyond the Marches* (1898); *The Man from Glengarry* (1901); *The Prospector* (1904); *The Doctor* (1906).

GOR'DON, Lord George: celebrated in connection with the London Prot. riots 1780: 1750, Sept. 19—1793, Nov. 1; b. London. At an early age he entered the British navy, and rose to the rank of lieut., but quitted the service during the American war, in consequence of a dispute with the Admiralty relative to promotion. Elected 1774 M.P. for Luggershall, he soon rendered himself conspicuous by his opposition to the ministers, and the freedom with which he attacked all parties; but though eccentric he showed ability in debate, and no deficiency of wit or argument. A bill having passed the legislature 1778 for the relief of Rom. Catholics from certain penalties and disabilities, the Prot. association of London was formed to procure its repeal; and 1779, Nov., Gordon was elected its president. In 1780, June, he headed a vast and excited mob, of about 100,000 persons, which went in procession to the house of commons, to present a petition against the measure, when he addressed them in a speech calculated to inflame their passions and bigotry. Dreadful riots ensued in the metropolis, lasting several days, in the course of which many Rom. Cath. chapels and private dwelling-houses, Newgate prison, and the mansion of the chief-justice, Lord Mansfield, were destroyed. Gordon was arrested and tried for high treason; but no evidence being adduced of treasonable design, he was acquitted. His subsequent conduct seemed that of a person of unsound mind. Having, 1786,, refused to come forward as a witness in a court of law, he was excommunicated by the Abp. of Canterbury for contempt. In 1786, he was convicted, on two official informations, for a pamphlet reflecting on the laws and criminal justice of the country, and for publishing a libel on the queen of France (Marie Antoinette) and the French ambassador in London. To evade sentence he retired to Holland, but was sent back to England, arrested at Birmingham, and died of fever

in Newgate prison. He latterly became a proselyte to Judaism.

GORDON, John Brown, American soldier: b. Upson co., Ga., 1832, July 6; d. near Miami, Fla., 1904, Jan. 9. He was graduated at the State University in 1852 and was, a few months later, admitted to the practice of law; but at the outbreak of the Civil War was engaged in mining operations near Raccoon Mountain, Alabama. Here was organized a company, called the 'Raccoon Roughs,' of which he was elected captain. This company was assigned to the 6th Alabama infantry, in which he rapidly rose through successive grades to that of colonel, 1862, April 28. At Seven Pines, through the wounding of General Rodes, the command of the brigade fell upon him; and at Malvern Hill he led it in the grand charge of D. H. Hill's division against the Federal position. At Sharpsburg he was five times wounded. In 1862, Nov. 1, he was commissioned brigadier-general with command of a Georgia brigade of six regiments, which he led with great distinction at Chancellorsville and Gettysburg. On the march into Pennsylvania, just before the battle of Gettysburg, he reached Wrightsville on the Susquehanna, making the most extended advance achieved in the East by Confederates during the war. On the first day at Gettysburg he struck the extreme right of the Union army in Ewell's grand turning movement, by which the victory so desperately striven for by A. P. Hill was secured, and the Federals were driven through the town of Gettysburg to the heights beyond. In 1864, May 6, in the Wilderness leading two brigades, he fell at sunset upon Sedgwick's corps, driving the Federals from a large part of their works and capturing 600 prisoners, including Generals Seymour and Shaler.

On May 12, at Spottsylvania Court House, commanding Early's division, immediately after Hancock had overwhelmed Edward Johnson, Gordon by an impetuous charge first checked the Federals and then drove them back to the base of the salient, where the fight continued with great fury to the close of the day. Two days later Gordon was commissioned major-general and placed in command of Evans' Georgia brigade, Hays' and Stafford's Louisiana brigades, and Terry's Virginia brigade—the latter being made up of the remnants of the 'Stonewall' brigade and other Virginia troops. With this command he participated under Early, in the defeat of Hunter's expedition, the invasion of Maryland, the victory at the Monocacy, the march into the suburbs of Washington, and the battles against Sheridan in the Shenandoah Valley, being especially distinguished in the surprise and rout of Sheridan's army in the early morning at Cedar Creek. Having been assigned to the command of the Second corps of the Army of Northern Virginia, he held his lines with great tenacity, and in 1865, March, made the brilliant dash by which he cap-

tured Fort Stedman and parts of the line to the right and left of it. Owing to the failure of the supporting column to arrive in time, he was obliged to retire to his original position. On the retreat from Petersburg he protected the rear, and at Appomattox commanded half of Lee's army, making a last brilliant charge of that heroic but now fearfully depleted host. He was twice elected governor of Georgia, and for two terms represented his State in the Senate of the United States. As commander-in-chief of the United Confederate Veterans' Association he possessed the enthusiastic love and devotion of his comrades, who would never entertain the idea of his retirement from the office to which they every year elected him, declaring repeatedly that death alone could remove him from that post of honor. His very successful lecture on *The Last Days of the Confederacy* was well known in both North and South. His war-time reminiscences began to appear in *Scribner's Magazine* in 1903 and were later published in book form.

GORDON, Sir John Watson: president of the Royal Scottish Acad.: 1788-1864, June 1; b. Edinburgh; son of a captain in the navy. He studied for four years with the desire to become a historical painter, but ultimately turned to portraiture, in which he achieved distinguished reputation. Gordon continued to reside in his native city. He exhibited in the Royal Scottish Acad. 1827, was elected 1841 an associate, 1850 an academician of the London Royal Acad.; and on the death of Sir William Allan, pres. of the Royal Scottish Acad., when the honor of knighthood was conferred on him. Gordon was as national in his art as it is possible for a portrait-painter to be—i.e., he excelled in transferring to the canvas those lineaments of character which are deemed pre-eminently Scotch.

GORDON, Joseph Claybaugh: an Am. educator: b. Piqua, O., 1842, Mar. 9; d. 1903. He was graduated at Monmouth College, Ill., 1866. He was the pioneer teacher in oral education in the United States. In 1869 he organized the oral department in the Indiana Institution for the Deaf; was prof. of mathematics and chemistry at Gallaudet College, Washington, D. C., 1873-97. In the latter year he was appointed superintendent of the Illinois Institution for the Education of the Deaf. He became a member of several educational societies. His publications include *Notes and Observations on the Education of the Deaf; Education of Deaf Children;* etc.

GORDONIA, *gawr-dō'nĭ-a:* genus of trees and shrubs of nat. ord. *Ternstrœmiaceæ,* having five styles combined into one, which is crowned with five stigmas, a 5-celled capsule, and winged seeds. Several species are natives of America, of which the most important is the Loblolly Bay (*G. Lasianthus*), found in swamps near the sea-coast of the Gulf of Mexico. Moist tracts of considerable extent are often covered with this tree alone. It attains

a height of 50 or 60 ft., has oblong, leathery, evergreen leaves, and beautiful white, sweet-scented flowers, more than an inch in diameter. The bark is much used for tanning.

GORDON PASHA. See GORDON, CHARLES GEORGE.

GORDS. See GOURDS.

GORE, n. *gōr* [AS. *gor*, wet filth, blood: Norw. *gor*, wet mud; O.H.G. *horo*, mud, ooze]: thick blood flowing from the body; thick or clotted blood; in *OE.*, dirt or filth. GORY, *a. gō'rĭ*, covered with congealed or clotted blood.

GORE, v. *gōr* [AS. *gar;* Icel. *geirr*, a spear, a javelin]: to pierce or wound with anything pointed, as with the horns of a bull. GO'RING, imp. GORED, pp. *gōrd:* connected with GORE.

GORE, n. *gōr* [Dut. *gheere*, the part which makes a garment larger: It. *gherone*, the gusset; Icel. *geiri*, a triangular piece of land; *geirr*, a spear, from the shape of its head]: a corner-shaped piece let into a garment to widen a part: in *heraldry*, a charge consisting of one-third of the shield cut off by two arched lines, one drawn from the dexter or sinister chief, and the other from the bottom of the escutcheon, meeting in the fess point. A Gore Sinister is one of the abatements or marks of dishonor for unknightly conduct. See GUSSET. GORE, v. to furnish with gores. See GOAR.

GORE, *gōr*, CATHERINE GRACE: 1799-1861, Jan. 27; b. East Retford, Nottinghamshire: English novelist. Her father, Mr. Moody, was a wine-merchant in moderate circumstances. In 1823, she was married to Capt. Charles Arthur Gore, with whom she resided many years on the continent, supporting her family by literary labor. She produced in all 70 works. She died at Lynwood, Hants. Her first published work was *Theresa Marchmont, or the Maid of Honor*, 1823. Some of her early novels, as the *Lettre de Cachet*, and the *Tuileries*, were vivid descriptions of the French revolution; but her greatest successes were her novels of English fashionable life, conspicuous among which were—*Cecil, or the Adventures of a Coxcomb;* and *Cecil, a Peer; The Ambassador's Wife; The Banker's Wife*, etc. She wrote a prize comedy, *The School for Coquettes; Lord Dacre of the South*, a tragedy; *Bond*, a dramatic poem; and some descriptive works.

GORE, CHRISTOPHER, LL.D.: 1758, Sep. 21—1827, Mar. 1; b. Boston: lawyer. He graduated at Harvard College 1776, studied law with Judge Lowell, and began practicing in Boston. He was appointed the first U. S. dist. atty. for Mass. 1789, and held the office till 1796, when he and William Pinckney were appointed commissioners to England to settle the American spoliation claims. On completing this mission he remained in London as charge d'affairs 1803-4, was gov. of Mass. 1809, U. S. senator 1814-17, and presidential elector 1817.

His will bequeathed legacies to Harvard College, the Mass. Hist. Soc., and the American Acad. of Sciences. Gore Hall, Harvard's library building, was named in his honor, and the college gave him the degree LL.D.

GÖREE, *go-rā':* very small island, belonging to the French, immediately s.e. of Cape Verd, off the w. coast of Africa. It is about three miles in circumference, contains a town defended by a fort, and covering two thirds of the island. Goree belonged first to the Dutch, 17th c. was taken by the English 1663; recovered by the Dutch 1664; captured by the French 1677; taken by the English 1758; afterward restored to France; again in English possession 1800-14, except for a few months in 1804; since 1814 a French possession. It is considered by the French as an important commercial entrepôt: its exports are gold-dust, ivory, wax, etc. Pop. island about 7,000; town, 3,000.

GORGE, n. *gŏrj* [F. *gorge*, a throat: It. *gorgo*, a gurgle, a whirlpool—from mid. L. *gorgĭă*—from L. *gurgēs*, a whirlpool]: the throat; the gullet; that which is swallowed; a narrow passage between hills or mountains: in *fortification*, the rear-opening into any defensive work, consisting of the space between the extremities of the two sides, as between the faces of a ravelin, or between the flanks of a bastion. The demi-gorges of a bastion are lines in continuation of the curtains on each side, extending from the extremities of the flanks to the point of intersection of the lines. GORGE, v. to swallow greedily; to feed to satiety; to glut: thence, to become choked, as the narrow passage of a river between high banks becoming 'gorged' with ice. GORG'ING, imp. GORGED, pp. *gŏrjd*, glutted: in *heraldry*, applied to an animal (lion, etc.) having a crown as a collar about its neck.

GORGEI, *gör'gėh-ē*, ARTHUR: general commander-in-chief of the Hungarian army 1848–9: b. 1818, Feb. 5, at Toporcz, county of Szepes (Zips). After a thorough military education, he got a commission as lieut. in the regt. of Palatine Hussars. Finding garrison-life monotonous, and promotion slow, Görgei became a zealous student of chemistry at Prague. At the outbreak of the revolution, he hastened to the seat of the first independent Hungarian ministry, offering his services, and was sent to Belgium, where he effected a purchase of arms for the new levies of Honvéds. He manifested great military capacity first after the rout of the Hungarian army near Schwechat, when he was made a gen. and conducted with consummate skill and courage, the retreat that had to be effected. His raw levies had to be kept together and drilled under the roaring cannon of the enemy; the disaffected officers, many of them foreigners and addicted to monarchy, to be retained under the revolutionary flag; a commissariat to be organized during fatiguing marches and constant fight-

ing. Perczel's corps was totally dispersed at Moor; government and diet were fleeing toward the Transylvanian frontier, and the dreary wilderness of the Carparthians threatened to become the tomb of all, in the midst of a winter little less severe than that which destroyed the Grand Army of Napoleon I. At the end of 1848, Hungary seemed lost; at the beginning of 1849, Mar., Görgei was concerting a plan for driving the enemy out of the country. After Dembinski's failure as gen.-in-chief, Görgei was declared the head of the united army corps of the north (hitherto his own), of the Upper Theiss, under Klapka, and of Szonnok, under Damjanich. 40,000 men, the finest army Hungary ever saw, broke forth from behind the Theiss, and drove the Austrians, with bloody losses, from one position to another. The battles of Hatvan, Bitske, Isaszeg, Gödöllö, Vácz, Nagy-Sarlo, were a succession of triumphs. Pesth was evacuated by the enemy, the siege of Komorn was raised, and before April ended, nothing was left in the enemy's hands except a small strip on the w. frontier, and the impregnable fastnesses which surround Tittel on the Lower Theiss. Buda, ancient capital of the realm, well fortified and garrisoned, was to be stormed, and for this the victorious campaign had to be interrupted. The delay was fatal. Russian armies hastened to the rescue of Austria, and regiments of veterans were despatched by Radetzky, the war in Italy being nearly over. The fortress of Buda was carried May 21, but the flower of the Hungarian infantry was buried among its ruins. In the latter part of June, the Austro-Russian army, under Haynau and Panjutine, beat Görgei near Zsigard; and the affair at Györ (Raab) resulted in the retreat of the Hungarians close to the walls of the fortress of Komorn. July 2, a bloody battle was fought near Szöny, where Görgei gave proofs of indomitable courage. July 16 a desperate fight took place in and near Vácz between Russians and Hungarians. Görgei, after some weeks, arrived in the neighborhood of Arad with an army decimated by continual fighting, by heavy marches, and by dysentery. At Debreczin the corps of Nagy-Sándor was sacrificed to allow an agonizing march of a few days. Aug. 9 the lower army, under Dembinski, was annihilated in the battle of Temesvár, and on the 10th, Görgei was declared dictator by a council held in the fortress of Arad, under the presidency of Kossuth. But further resistance on the part of the Hungarians had become hopeless, and on the 13th Görgei's army surrendered at Világos to Prince Paskiewitch, commander-in-chief of the Russian forces. This surrender has often been imputed to Görgei as treachery. Whether such imputation is permissible, may be judged from the fact that on the day of surrender Görgei had 24,000 men with 140 cannon, and that five armies, with more than 200,000 men and 1,000 cannon, were closing upon him from different directions. Görgei was confined to Klagenfurt, whence he was released

on parole, and engaged in chemical studies. In 1852, he published at Leipsic (translation at London in the same year), *Mein Leben und Wirken in Ungarn in den Jahren* 1848 *und* 1849; and 1869, *Hungary in* 1849 *and after* 1866.

GORGEOUS, a. *gŏr jŭs* [Norm. F. *gorgias*, or *gourgias*, gaudy, flaunting, proud: connected with F. *gorge*, the throat]: showy; splendid; glittering in a variety of colors. GOR'GEOUSLY, ad. *-lĭ*. GOR'GEOUSNESS, n. *-nĕs*, splendor of raiment; magnificence.

GORGES, *gawr'jez*, SIR FERDINANDO: about 1565–1647; b. Somersetshire, England: lord-proprietary of Maine. He was a fellow-conspirator with the Earl of Essex, but testified against him when on trial for treason 1601. He served in the royal navy during the war with Spain and was rewarded with the office of gov. of Plymouth 1604. In the following year he became interested in the subject of American colonization, helped organize the Plymouth Company, incorporated 1606, and after promoting several unsuccessful expeditions to the New England coast sent off two vessels which reached the mouth of the Kennebec in Me., where a fortified store-house named Fort George was erected 1607. This colony was abandoned in the following year. Unsuccessful attempts to plant colonies were made 1615, and one party established itself on the Saco in the winter 1616–17. In 1620 he with 30 other patentees, including 13 peers, formed a corporation and obtained a charter for the 'planting, ruling, ordering, and governing of New England in America.' For his share he united with James Mason in taking the proprietorship of the dist. called Laconia, which was regarded as extending from the Kennebec to the Merrimac. In 1623, his son Robert Gorges was commissioned lieut.gov. of New England, and the two co-operated in attempting numerous settlements. The corporation surrendered its charter to the king 1635, but Gorges obtained a new one 1639, in which he was made lord-proprietary of the province of Me., and the office declared to be hereditary in his family. The greater part of his colonization schemes were failures, though Georgiana, which he chartered 1642, became the present town of York, Me. In 1643 a confederacy was formed by all the New England colonies exclusive of Gorges's settlements; and these settlements at his death fell to his son John. The new proprietor took little or no interest in the settlements, and after many ineffectual attempts to learn his wishes they formed themselves into a separate administrative body and afterward gave their adhesion to Mass. Gorges's grandson, FERDINANDO GORGES (1629–1718), sold all his proprietary rights in Me. to Mass. for £1,250 in 1677. He published *America Painted to the Life* (London, 1659).

GORGET, n. *gŏr'jĕt* [F. *gorgette*—from *gorge*, the

throat]: a piece of armor for the throat; small crescent-shaped ornament formerly worn by military officers on the breast; kind of knife, or series of instruments formerly used by surgeons in cutting for stone. See LITHOTOMY.

GORGIAS, *gawr'jĭ-as:* celebrated Greek rhetorician, of the time of Socrates: approximately B.C. 483–375; b. at Leontini, Sicily. Little is known of his life. He settled in Greece, residing mostly at Athens, and at Larissa in Thessaly, and died between 105 and 109 years of age. Gorgias has been immortalized by Plato in a dialogue which bears his name. Two works attributed to him are extant. *The Apology of Palamedes* and *Encomiums on Helena,* but their genuineness has been disputed. Gorgias showed little aptitude for theorizing on the art which he professed to teach, and was not remarkable for speculative acumen, but appears to have been a quick and judicious *observer.* He avoided, according to Plato, general definitions of virtue and morality; but Aristotle notices that he had a true appreciation of the facts of morality, as they are manifested in life and character, and the picture given of him by Plato is in harmony with this. He did not wish to be thought a *sophist,* but only a *rhetorician,* and the ancients were in fact at a loss whether to consider him the latter or both. In philosophy, he held: (1) There is nothing that has any real existence; (2) Even if anything really exists, it cannot be known; (3) Even if real existence is knowledge, the knowledge is incommunicable. In nat. philos. he seems to have agreed with Empedocles. See monograph by Foss (1828), *De Gorgia Leontino Commentatio.*

GORGON, n. *gŏr'gŏn* [Gr. and L. *gorgon,* a Gorgon—from Gr. *gorgos,* fierce: comp. Gael. *gorg,* fierce]: anything very horrid or ugly. In Gr. *myth.,* according to Homer, a frightful monster inhabiting the infernal regions, the head of which was peculiarly appalling. Homer and Euripides make mention of only one Gorgon, the daughter of Terra, who was slain by Minerva; while Hesiod mentions three Gorgons—Stheno, Euryale, and Medusa, daughters of Phorcys and Ceto, called likewise the Phorcides. Their habitation, according to the same author, was in the Western Ocean, in the neighborhood of Night and the Hesperides; while Herodotus and other later writers place it in Libya. They are represented as girded with serpents with heads erect, vibrating their tongues, and gnashing their teeth. Æschylus describes them as winged virgins with brazen claws, and enormous teeth, having two serpents round their bodies by way of girdle. The name Gorgon was given especially to Medusa. According to later legends, Medusa was originally a very beautiful maiden, and the only one of the three sisters who was mortal. But she having become a mother by Neptune in one of Minerva's temples, that virgin goddess was so affronted that she changed Me-

dusa's hair into serpents, giving her so fearful an appearance that whoever looked on her was turned into stone. Medusa was killed by Perseus (q.v.) and her head was afterward placed in the shield of Minerva. Various explanations have been given of the myth by the ancients and the moderns, but none satisfactory.—Compare Levezow, *Ueber die Entwickelung des Gorgonenideals in der Poesie und bildenden Kunst der Alten* (Berlin 1833). GORGO'NEAN, or GORGO'NIAN, a. *-gō'nĭ-an*, like or pertaining to a Gorgon; very ugly or terrific. GORGONEIA, n. *gŏr'gŏ-nē'yă*, masks carved in imitation of the Gorgons' heads, used as key-stones in arches; sing. GOR'GONEI'ON, *-nēyŏn*.

GORGONIA, *gawr-gō'nĭ-a* [named from their branching flexible stems]: genus of zoophytes (*Anthozoa*), allied to *Aleyonium* (q.v.). The whole structure (polypemass) is rooted and branching, consisting of a horny central axis with polypiferous flesh, which when dried becomes a friable crust full of calcareous spicules. The hard stem is composed of concentric layers, probably formed in succession by consolidation of the fleshy substance. The stem is usually brown or black, while the flesh, or even the dried crust, often has colors of great brilliancy. The polypes have eight tentacles. The species most generally known is *Gorgonia flabellum*, or *Flabellum Veneris*, called also the Sea-fan, or Venus's Fan, a tropical species, often brought as a curiosity from the W. Indies, a striking and characteristic specimen of this genus, and of the family *Gorgoniadœ*.

GORHAM, NATHANIEL: 1738, May 27—1796, June 11; b. Charlestown, Mass.: statesman. He received a common-school education, engaged in mercantile business, and became active in public affairs early in the revolutionary period. He was a member of the legislature 1771–75, delegate to the provincial congress 1774–5, member of the committee on war 1778–81, delegate to the continental congress 1782–3, 1785–87 and pres. of it 1786, and was pres. three months of the convention that framed the Federal constitution and judge of the Mass. court of common pleas several years.

GOR'HAM CONTROVERSY: controversy in the Church of England, arising from the refusal of Dr. Philpott, Bp. of Exeter, to institute the Rev. Cornelius Gorham, formerly fellow of Queen's College, Cambridge, and then vicar of St. Just-in-Penrith, to the vicarage of Brampford Speke, on his presentation thereto by the lord chancellor. The alleged ground of this refusal was, that after examination the bishop found Mr. Gorham unsound in doctrine as to the efficacy of the 'Sacrament' of Baptism, inasmuch as he held that spiritual regeneration is not given or conferred in that rite, and in particular, that infants are not made therein 'members of Christ and the children of God,' as the cate-

chisms and formularies of the church declare them to be. The case was brought before the arches court of Canterbury, which decided (1849) that baptismal regeneration is the doctrine of the Church of England and that Mr. Gorham maintained doctrines on that point opposed to those of the church; that consequently the bishop had shown sufficient cause for his refusal to institute, and that the appeal must be dismissed with costs. From this decision, Mr. Gorham appealed to the judicial committee of privy council. That committee complained that the bishop's questions were intricate and entangling, and that the answers were not given plainly and directly. Their decision was in substance as follows: and it must be noted what points they undertook to decide, and what they left. The court declared that it had no jurisdiction to settle matters of faith, or to determine what ought, in any particular, to be the doctrine of the Church of England, its duty being only to consider what is by law established to be her doctrine on the legal construction of her articles and formularies. It appeared that very different opinions as to baptism were held by the promoters of the reformation; that differences of opinion on various points left open were always thought consistent with subscription to the articles: also, that opinions in no important particular distinguished from Mr. Gorham's had been maintained without censure by many eminent prelates and divines. Without expressing any opinion as to the theological accuracy of Mr. Gorham's opinions, the court decided that the judgment of the arches court should be reversed. Mr. Gorham was accordingly instituted to Brampford Speke. During the two years that the suit was pending, the theological question was discussed with various degrees of ability and acrimony in sermons and pamphlets; and it was expected that if the judgment had gone the other way, a large body of the evangelical clergy, many of whom hold views more or less in accordance with those of Mr. Gorham, would have seceded from the church.

GORILLA, n. *gō-rĭl'lă* [an African word: said by Latham to be found in a Gr. translation of an anc. Carthaginian work in the plural *gorillai*], (*Troglodytes Gorilla*): a great African ape, of about the size of man; referred by naturalists generally to the same genus with the ehimpanzee, though Prof. Isodore Geoffroy St. Hilaire has attempted to establish for it a separate genus. It has its name from the supposition that it is the same animal mentioned in the *Periplus* of Hanno, Carthaginian navigator, who visited the tropical parts of the w. coast of Africa about B.C. 350, though it is far from certain that the gorilla of Hanno is not the chimpanzee. Vague accounts of apes of great size, and of which wonderful stories were told, were from time to time brought from w. Africa: but it was not till 1847 that the gorilla became really known to naturalists,

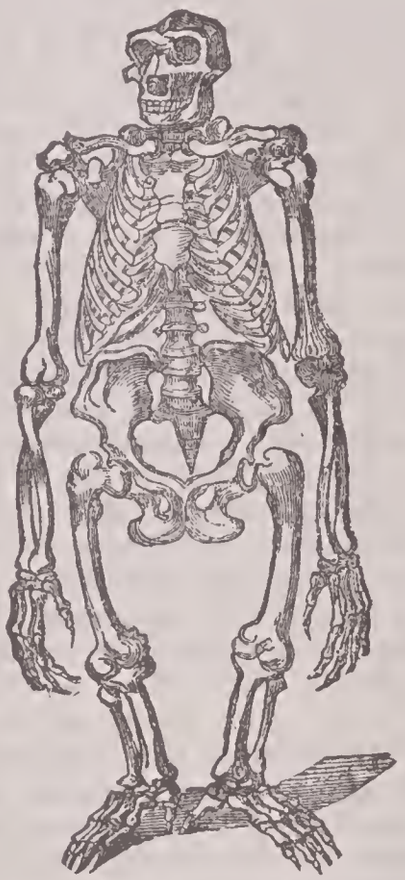
when a skull was sent to Dr. Savage, of Boston, by Dr. Wilson, American missionary on the Gaboon river. Since that time, not only have skeletons and skins been obtained in sufficient number for scientific examination, but information has been procured concerning the habits of the animal in its native haunts. The accounts of the gorilla in Du Chaillu's *Explorations and Adventures in Equatorial Africa* (Lond. 1861) are regarded by the highest scientific authorities, particularly by Owen, as in the main trustworthy, notwithstanding all the doubt that was at first cast over that traveller's narrative, and there is little doubt that they accord with all that we have learned from other sources, and

Gorilla.

with inferences from the dentition and osteology of the animal.

The gorilla differs from the chimpanzee in its greater size; the height of an adult male in erect posture being commonly about five ft. six inches or five ft. eight inches, though there is reason to think that it sometimes exceeds six ft. Its strength appears greater in proportion to its size, and even its skeleton indicates very great muscular power in jaws and limbs. The bony ridges in the skull above the eyes are extremely prominent, and the skull of the male exhibits also a large occipital ridge on the top of the head. The brain is small. The nasal bones project more than in the chimpanzee, thus producing an approximation to the human

face, in a somewhat prominent nose. The lower part of the face, however, projects excessively; moreover, the teeth do not form a perfectly uninterrupted series as in man and the canine teeth are very large, particularly in the male, projecting considerably more than an inch from the upper jaw—much larger in proportion than in the chimpanzee; though; on the other hand, the molars bear a greater proportion to the incisors, and thus approach more to the human character. The breadth at the shoulders is great. There are 13 pairs of ribs. The pelvis approaches the human form more than in any other ape. The arms are not so long as in the chimpanzee, but reach nearly to the knee in the erect position.



Skeleton of Gorilla.

The lower limbs, though shorter in proportion than in man, are longer than in the chimpanzee. The foot is less turned inward than in the chimpanzee, and is better fitted for walking on the ground; the great toe is a true thumb, as in the chimpanzee, standing out from the foot at an angle of about 60°, and is remarkably large and strong. The hands or paws of the fore limbs also are remarkable for great size, thickness, and strength. The fingers are short, but the circumference of the middle finger at the first joint is sometimes more than six inches.—The gorilla has a black skin, covered with short dark-gray hair, reddish brown on the head; the hair on the arms longer, that on the arm from the shoulder to the

elbow pointing downward, and that on the fore-arm pointing upward to the elbow, where a tuft is formed. The face is covered with hair, but the chest is bare. There is scarcely any appearance of neck. The mouth is wide, and no red appears on the lips. The eyes are deeply sunk beneath the projecting ridge of the skull, giving to the countenance a savage scowl, the aspect of ferocity being aggravated by frequent exhibition of the teeth. The belly is very large and prominent; in accordance with which character the gorilla is represented as a most voracious feeder, its food being exclusively vegetable—obtained partly by climbing trees, and partly on the ground. It is very fond of fruits and of some leaves, as the fleshy parts of the leaves of the pine-apple; and employs its great strength of jaws and teeth in tearing vegetable substances and cracking nuts which would require a heavy blow of a hammer. It is not gregarious in its habits. It spends most of its time on the ground, though often climbing trees. It is capable of defending itself against almost any beast of prey. It has a kind of barking voice, varying when it is enraged to a terrific roar. It inhabits exclusively the densest parts of tropical forests, and is found only in regions where fresh water is abundant. It is much dreaded by the people of the countries which it inhabits, though by some of the tribes its flesh is sought as food. Many strange stories are current among them about its habits, which seem entitled to little regard—e.g., its carrying away men and women, and detaining them for some time in the woods—its lying in wait on the branch of a tree till a man passes beneath, furtively stretching down one of its hinder legs to catch him, and holding him in the grasp of its foot, or rather hand, till he is strangled; and the like.—The gorilla has not been hitherto tamed, and in an adult state at least, seems incapable of it. In 1876, a live gorilla was brought to Berlin, the first authentic instance of the introduction of the animal into Europe. The name given to this animal in its native country is *Ngina*, or *Ingeena*. See CHIMPANZEE; MONKEY; etc.

Hartmann (in *Anthropoid Apes*) disputes Du Chaillu's assertion that there are two other species of *Troglodytes*, Nschiego-Mbouvé and Koolo-kamba; the former is certainly a chimpanzee. Probably the distinction drawn by some between *gorilla gina* and *gorilla manyema* is only between varieties of the one species.

GORKUM, *gŏr'kŭm* (Dutch *Gorinchem*): town and fortress in the Netherlands province of s. Holland, on the Merwede, where it is joined by the Linge, 22 m. e.s.e. of Rotterdam. It is well built, has a town-house, military establishments, and trade in agricultural produce and fish, especially salmon. Ship-building, making leather ropes, beer, book-printing, etc., are chief industries. Pop. 12,000.

GOR'KY, MAXIM, pen name of Alexei Maximovitch

Pyeshkoff, Russian author: b. Nijni Novgorod 1868. He traveled over a large part of his native country as a tramp after serving in many employments from that of a ship's cook to that of a lawyer's clerk. The varied scenes and persons he saw in his vagabond life among the lowest of the population furnished him with rich material for his subsequent literary work, in which he takes upon himself to interpret *la misère* as it is in western and southwestern Europe. His style is like a flash-light revealing features of debased or tragic character with vivid realism, but his view of his subject is tinged with melancholy pessimism. Among his most admired works are: *Chelkash; Song of the Falcon; Song of the Petrel; The Orloff Couple and Malva; Twenty-six and One; Foma Gordyeeff; Makar Choudra; Troye; About the Devil; More about the Devil; The Reader; The Outcasts* (1902); *Three Men* (1902); etc.

GORLITZ, *gör'lĭts*: fortified town of Prussia, province of Silesia, a principal station on the railway from Dresden to Breslau; on a declivity on the left bank of the Neisse, 52 m. w. of Liegnitz. It is well built, surrounded by old walls, and flanked with towers, the chief of which is Kaisertrutz, now the guard-house and armory of the town. Among the many beautiful Gothic churches, the most interesting is that of St. Peter and St. Paul, built 1423–97, and having five naves, a magnificent organ, and a bell 12½ tons in weight. In the n.w. of the town is the Kreuzkapelle (Chapel of the Cross), an imitation of the Holy Sepulchre at Jerusalem. Gorlitz has also a gymnasium with an excellent library, numerous educational and benevolent institutions, and a theatre. A viaduct more than 1,500 ft. in length, and 115 ft. high, here crosses the valley of Neisse. Pop. 81,000.

GORMAN, Arthur Pue: legislator; b. 1839, Mar. 11; d. 1906, June 4; was a page in the U. S. Senate, 1852–66. In the latter year he was made collector of internal revenue for the 5th district of Maryland. In 1872 he became president of the Chesapeake and Ohio Canal Co.; was elected a U. S. Senator from Maryland, 1881, and re-elected, 1887, 1893, and 1902. The Democrats made him their leader in the U. S. Senate, 1903.

GORMAND, n. *gŏr'mănd*, or Gourmand, n. *gôr'mănd* [F. *gourmand*, a glutton—from prov. F. *gourmer*, to taste wine: OF. *gormand*, belly-god]: a greedy eater; a glutton; one who studies good living. Gor'mandize, v. *-dīz*, to eat greedily. Gor'mandizing, imp.; Adj. gluttonous: N. gluttonous habits. Gor'mandized, pp. *-dizd*. Gor'mandizer, n. *-zėr*, one who eats much and greedily. Gor'mandism, n. *-dizm*, gluttony.—Syn. of 'gormand:' epicure; voluptuary; sensualist.

GO'RO. See Gorozo.

GOROZO, Goro Saburo: name of a family in Kioto, Japan, famous for 9 generations as metal-workers and

especially for their exquisite art productions in the various forms of bronze. Japanese artisans seem to possess a method of forming amalgams, and of overlaying one metal on another unknown elsewhere, and the cloisonné, champlevé, and repoussé works of the Gorozo family, stamped with the family name *Goro*, and that of its living head, are known and highly prized the world over.

GÖRRES, *gör'ĕs*, JAKOB JOSEPH VON: 1776, Jan. 25—1848, Jan. 27; b. Coblenz: German author. In common with most of the ardent youth of the time, Görres threw himself eagerly into the movement of the French Revolution; became an active member of the clubs and debating societies which sprang up in all the towns on the French border, and established a newspaper, the *Red Journal*, exponent of extreme opinions. In 1799, he went to Paris as chief of a deputation to negotiate the annexation of the Rhineland to the French republic, but the revolution of the 18th Brumaire put an end to this and all similar dreams. Görres returned to Germany, disgusted with politics, quietly settled down in a professorship in his native town, and applied himself to literature for several years. His works on art, on physiology [illegible] the laws of organism, and on the relations of faith and science, attracted much attention. In 1806, he published the first part of his well-known collection of *German Popular Legends;* and 1806, his work on the mythology of the Asiatic nations, and a further contribution to the legendary literature of Germany. From these studies he was aroused to the hope of liberation from French tyranny, by the reverses of the French arms in the Russian expedition. Görres was not slow to appeal to the national sentiment of his countrymen in the *Rhenish Mercury*, one of the most spirit-stirring journals which Germany had ever possessed; he became, in truth, the literary centre of the national movement. After the re-establishment of German independence, Görres continued the career of a journalist, and withstood the encroachments of domestic absolutism with the same energy with which he had denounced the tyranny of foreign occupation; until having drawn the displeasure of the government, he fled to France, and afterward to Switzerland. In 1827, he gladly accepted the professorship of the history of literature in the new Univ. at Munich. His later years were given to literature, and in part to the animated religious controversies occasioned in Germany by the contests between the Abp. of Cologne and the Prussian govt. on mixed marriages and Hermesianism. See HERMES. Görres was an ardent Rom. Catholic, and was, if not the originator, at least the main supporter of the Rom. Cath. journal, *Historisch-Politische Blätter*. The liberals of these days, however, claiming Görres as of their company, deny that he ever insisted on the supremacy of Rome.

GORRINGE, HENRY H.: an American naval officer;

1841, Aug. 11—1885, July 6; entered the U. S. Navy 1862. He is principally known by his removal from Egypt to New York of the Egyptian obelisk (Cleopatra's Needle), which was a gift to the United States from the Khedive. The obelisk reached New York, 1880, July 20, and was erected in Central Park, 1881, Jan. 23. Gorringe wrote *A History of Egyptian Obelisks.*

GORSE, n. *gŏrs* [W. *gores,* or *gorest,* waste, open]: a prickly shrub bearing yellow flowers; whin or furze; the *Ulex europæus,* ord. *Lĕgumĭnōsæ.* GORSY, *a. gŏr'sĭ,* abounding in or resembling gorse.

GOR'TON, SAMUEL: about 1600–1677; b. Gorton, England, founder of sect of 'Nothingarians.' He received a meagre education, was apprenticed to a clothier, became very religious, and emigrated to Boston 1636 to escape ridicule for his peculiar opinions. He had been there but a short time when he was expelled from the colony for heresy. Being permitted to settle in Plymouth his religious opinions led to his being arrested, imprisoned, fined, and again expelled 1637-8. He then took refuge in Aquidneck, now Newport, R. I., where he was publicly whipped for speaking contemptuously of the magistrates, and fled to Pawtuxet, where he became involved in disputes with the colonists over land purchases. The authorities summoned him to Boston for trial, but instead he removed to Shawomet and bought land of the Indians. In 1643 some Indians believing that they had been defrauded by him applied to the gen. court at Boston for redress, and 40 soldiers were sent thither and took him and 10 of his followers prisoners. They were tried as heretics and sentenced to hard labor in irons, but were released and ordered to leave the colony 1644, Oct. He then returned to Shawomet, renamed his colony Warwick, and became a preacher, magistrate, and founder of the sect of 'Nothingarians,' so named because they repudiated every kind of religious forms and recognized no ministry. He published *Simplicitie's Defense against Seven-Headed Policy* (London, 1646); *An Incorruptible Key composed of the CX. Psalm* (1647); *Saltmarsh returned from the Dead* (1655); *An Antidote against the Common Plague of the World* (1657); and *Certain Copies of Letters.* Gov. Winslow published *Narrative of Disturbances made in New England by Samuel Gorton and his Accomplices* (1649).

GORTSCHAKOFF, *gawrt-châ-kof',* or GORCHAKOV: Russian family; tracing its ancestry through St. Michael of Tschernigoff (b. 1246) to Rurik and Vladimir the Great.—Prince PETER GORTSCHAKOFF, gov. of Smolensk, defended that town two years, 1609-11, against Sigismund of Poland, who at last took it by storm.—Prince DIMITRI GORTSCHAKOFF (1756–1824) was a celebrated Russian poet, and wrote odes, satires, and epistles.—Prince ALEXANDER GORTSCHAKOFF (1764–1825) served under his uncle Suwaroff in Turkey and Poland, showed

great courage at the capture of Praga (suburb of Warsaw), and was made lieut.-gen. 1798. In the campaign of 1799 he commanded under Korsakoff at Zürich, was subsequently made military gov. of Viborg, repulsed Marshal Lannes at Heilsburg, and commanded the right wing at the battle of Friedland. He was minister of war from 1812 to the end of the war, when he was made gen. of infantry, and member of the imperial council.—Prince ANDREAS GORTSCHAKOFF served 1799 as maj.-gen. under Suwaroff in Italy; and commanded a division of grenadiers in Borodino 1812, where he was wounded. In the campaign of 1813–14, he commanded the 1st corps of Russian infantry, and distinguished himself at Leipsic and Paris. He was made gen. of infantry 1819, and 1828 retired from active service.—Prince PETER DIMITRIEVICH GORTSCHAKOFF (1790–1868) was in the campaigns of 1813–14: and served in Caucasia under Gen. Yermoloff. As chief of the general staff of Wittgenstein 1826, he was one of the signers of the treaty of Adrianople. In 1839, he was appointed gov.-gen. of Eastern Siberia, and occupied that important post until, 1851, he retired from active life. On the outbreak of the Crimean war, however, he offered his services, and at the battle of the Alma he commanded the left wing of the Russians; he was also in the battle of Inkermann.

GORTSCHAKOFF′ (or GORCHAKOV), Prince ALEXANDER MIKHAIL: Russian diplomatist: 1798—1883, Mar. 11; brother of Prince Peter Dimitrievich Gortschakoff. He was sec. of the Russian embassy in London 1824, was sent to Florence 1830, Vienna 1832, and Stuttgart 1841. In 1854 he represented Russia in the Vienna conferences; and 1856 he became minister of foreign affairs. In 1870, he issued his circular setting aside the treaty of 1856, and leading to the London Conference 1871. He was the guiding spirit of Russian policy during the critical period 1877–79, and was one of the most prominent members of the Berlin Congress 1878. After 1863, at which time he was the most powerful minister in Europe, he was honored with the title of chancellor of the empire. He retired from the ministry of foreign affairs 1881.

GORTSCHAKOFF′ (or GORCHAKOV), Prince MIKHAIL DIMITRIEVICH: 1792–1861, May 30; brother of Prince Peter Dimitrievich Gortschakoff. He began his military career as an officer of artillery, and directed operations 1828 at the sieges of Silistria and Schumla. Chief of the staff of Count Pahlen 1831, he gave proofs of extraordinary valor in the battle of Ostrolenka and at the taking of Warsaw. He was wounded at Grohow, and made gen.; succeeded Count Toll as chief of the staff of the whole army, was appoined gen. of artillery 1843, and military gov. of Warsaw 1846. In 1853, he commanded the Russian forces numbering abt. 60,000 in the Danubian provinces, crossed the Danube, at Braila,

1854, Mar. 23, occupied the frontiers of Bessarabia, and 1855, Mar., as Russian commander-in-chief in the Crimea; directed the defenses of Sebastopol, attacked by the armies of Great Britain and France. As a reward for his services in this unsuccessful but brilliant defense, Prince Gortschakoff was appointed by Emperor Alexander II. lieut.-gen. of the kingdom of Poland, and was for several years a wise and conciliatory representative of his youthful emperor at Warsaw.

GOR'Y DEW: dark red slimy film frequently seen on damp walls and in shady places; often on the whitewashed walls of damp cellars, where its appearance sometimes has startling resemblance to blood. It is one of the lowest forms of vegetable life, one of the *algæ* of the group *Palmellaceæ* (included in *Confervaceæ*), and nearly allied to the plant to which the phenomenon of RED SNOW (q.v.) appears chiefly due. Its botanical name is *Palmella cruenta*. It sometimes extends over a considerable surface, and becomes a tough gelatinous mass. For the structure and mode of growth of this and allied plants, see PALMELLACEÆ. Its characteristic red color appears also in *Hæmatococcus sanguineus*, a nearly allied plant, found in similar situations, but which seems to extend more as an aggregation of cells, not soon melting down into an indefinite slime like the cells of the *Palmella*. The prevalent color of the group, however, is green.

GOSCHEN, *go'shĕn*, GEORGE JOACHIM: statesman: b. London, England, 1831, Aug. 10; d. Hawkhurst, Kent, 1907, Feb. 7. He was educated at Rugby and Oriel College, Oxford, and was engaged in mercantile business 1853–63. He was elected M.P. for London as a liberal 1863, re-elected 1865, made vice-pres. of the board of trade and privy-councilor 1865, Nov., and chancellor of the Duchy of Lancaster and a cabinet-minister 1866, Jan., and retired with the Russell ministry. On the accession of Mr. Gladstone, 1868, Dec., he was appointed pres. of the poor-law board, and, 1871, Mar., first lord of the admiralty, retiring on the defeat of his party 1874. In 1876 he was chosen delegate of the British holders of Egyptian bonds to effect a conversion of the debts and bonds; 1878 was British delegate to the international monetary conference in Paris; 1880, on Mr. Gladstone's return to power, was appointed ambassador extraordinary at Constantinople to aid in forcing Turkey and Greece to execute the unperformed parts of the treaty of Berlin; 1882 appointed an ecclesiastical commissioner for England; 1885, elected M.P. for the e. division of Edinburgh; 1886 defeated by a large Gladstone-liberal majority; and 1887, Jan. 14, became chancellor of the exchequer of Great Britain and Ireland and in Lord Salisbury's cabinet. In 1895 he again took office under the same leader as First Lord of the Admiralty. From this office he retired toward the end of 1900, and was soon after raised to the peerage as Viscount Goschen. He

represented Ripon in Parliament 1880-5, when he was returned for Edinburgh, and was member for St. George's, Hanover Square, 1887-1900. He was author of several financial and political pamphlets, and of a well-known work on the *Theory of Foreign Exchanges* (1864). He was a hearty supporter and confidential friend of Mr. Gladstone till the latter introduced his famous Home-rule Bill 1886, when Goschen opposed both friend and measure with great vigor.

GOSHAWK, n. *gŏs'hawk* [AS. *gos-hafoc*—from *gós*, a goose; *hafoc*, a hawk: Icel. *gás-haukr*], (*Astur*): genus of *Falconidæ* (q.v.), distinguished from the true falcons by a lobe or festoon, instead of a sharp tooth, on the edge of the upper mandible, and by the shortness of the wing, which reaches only to the middle of the tail. It is more nearly allied to the sparrow-hawks, from which it is distinguished by its more robust form, by its shorter legs, and by the middle toe not being elongated, as in that genus. The species to which the name goshawk originally and strictly belongs (*A. palumbarius*), is very widely diffused over Europe, Asia, n. Africa, and N. America, chiefly in hilly and wooded regions. It is now very rare in Britain. Although one of those that were called ignoble birds of prey, it was much used for falconry, being easily trained, and very successful in catching such game as is either confined to the ground, or does not rise far from it, or such as is to be found in woods, through the branches of which the goshawk readily threads its way in pursuit. The goshawk was thus flown at hares, rabbits, pheasants, partriges, etc. It ordinarily seeks its prey by flying near the ground, and can remain a very long time on the wing. It follows its prey in a straight line, not rising in the air to descend upon it, like the falcons; and when baffled by the object of pursuit entering a wood and hiding itself in some covert, will perch on a bough, and await its reappearance with wonderful patience for many hours. Its flight is very rapid. The goshawk builds in trees. Its nest is very large.

GOSHEN, *gō'shĕn*: that part of ancient Egypt which Pharaoh gave to the kindred of Joseph when they came to sojourn in that country. It appears to have been between the e. delta of the Nile and the frontier of Palestine, and to have been suited mainly for a pastoral people, which the Hebrews were. Rameses, the principal city of the land, was the starting-point of the Exodus of the chosen people who reached the Red Sea in three days. From this and other circumstances, it has been concluded that the *Wáde-t-Tumeylát* (the valley through which formerly passed the canal of the Red Sea, and at the w. extremity of which Rameses was situated) is probably the Goshen of the Old Testament. Another land and city of Goshen in southern Palestine are mentioned in the Old Testament.

GOSHEN, Ind., city, capital of Elkhart co., on Elkhart river, and the Cleveland, C. C. and St. L., and the Lake Shore & M. S. railroads, 95 m. s.e. of Chicago. Its principal industrial establishments are flour-mills, bicycle and machine shops, woolen-mills, sash and door factories, veneering and furniture shops; rubber goods, underclothing, mittens, and shirts are also manufactured here to a considerable extent. The city owns and operates the electric light and waterworks plants, and it has handsome public library and high school buildings. It is situated in a fertile agricultural section, and the chief export shipments are hay, grain, and live-stock. Pop. (1910) 8,514.

GOSHEN, N. Y., one of the capitals of Orange co., on the New York, L. E. & W., and the Lehigh & N. E. R.R's 59 m. n.w. of New York. It was founded as long ago as 1714, and incorporated in 1809. It manufactures include bricks, tiles, glass, foundry products, and cider; but its chief interests are connected with the dairying business, in which it controls a large trade, and its products are widely celebrated for their excellence. The municipality owns the waterworks. Pop. (1910) 3,081.

GOSHENITE, n. *gō'shēn-īt* [from Goshen, Mass., where it occurs]: variety of beryl.

GOSLAR, *gŏs'lâr*: small but ancient and interesting town of Hanover, on the border of Brunswick, on the Gose, from which the town derives its name, 26 m. s.e. of Hildesheim. It was formerly a free imperial city, and the residence of the emperor. Of all its ancient fortifications, the walls and one tower—the Zwinger, the walls 21 ft. thick—are all that remain. Of the venerable cathedral, the porch (date 1150) is the sole relic; the remaining portion of the old imperial palace has been lately restored; the Gothic church in the market-place dates from 1521; the hotel the *Kaiserworth* has eight portraits of German emperors. Goslar was founded by Heinrich I. about 920; and under Otto I. the mines, for which Goslar has ever since been celebrated, were opened in 986. The mines of gold, silver, copper, lead, and zinc are, however, nearly exhausted. Pop. about 19,000.

GOSLARITE, n. *gŏs'lăr-īt* [*Goslar* in the Harz Mountains]: a mineral, a native sulphate of zinc.

GOSLING, n. *gŏz'lĭng* [AS. *gos*, a goose, and *ling*, dim. termination]: a young goose; a catkin on nut-trees and pines.

GOSNOLD, *gos'nold*, Bartholomew: d. 1607, Aug. 22; b. England: navigator. He was associated with Sir Walter Raleigh in his unsuccessful attempt to establish an English colony in Va., and in 1602 returned to America with a party of colonists, sailing more directly across the Atlantic instead of on the s. course of previous navigators, and coming to anchor in York harbor, Me., May 14. On the following day he sailed for a more suitable

place of settlement, entered Mass. Bay, named the great promontory Cape Cod, and with four of his men went ashore there. Afterward he sailed around the cape, discovered the island No Man's Land, and planted his colony on an island at the mouth of Buzzard's Bay which he named Elizabeth in honor of his queen, but which is best known by the Indian name Cuttyhunk. His people became discouraged within a few months and returned to England. Gosnold next turned his attention toward Virginia, and after long effort succeeded in organizing a company for colonization in that region, the heads of which were Edward Wingfield, Robert Hunt, and the famous Capt. John Smith. In 1606 he obtained a charter from James I., the first under which an English colony was established in America, and sailing with three vessels and 105 people, entered a river in Va., which he named after the king, and founded Jamestown, 50 m. from its mouth, early in 1607. The site was unhealthful, and Gosnold with 50 of his people died before autumn. The Massachusetts township of Gosnold, comprising the Elizabeth Islands, was named in his honor.

GOSPEL, n. *gŏs'pĕl* [AS. *god-spell;* Icel. *guds-spial*, God-story, the word of God—from AS. *god*, Icel. *guds*, God, and AS. *spell*, Icel. *spiall*, word, discourse, tidings: Goth. *spillon*, to tell—see Skeat]: *literally*, words from God; the narrative of God—i.e., the life of Christ; one of the four histories of Christ handed down to us by the inspired writers, Matthew, Mark, Luke, and John; the whole system of the Christian faith; God's word; general doctrines of the New Test. GOSPELER, or GOS'PELLER, n. *-lėr*, he who reads the Gospel at the altar (also, see GOSPELERS below). GOSPEL TRUTH, the doctrines or truths of the New Test.; certain truth. GOSPEL SIDE OF THE ALTAR, the right side of the altar or communion table, looking *from* it, at which side, in the English Church service, the gospel appointed for the day is read. It is of higher distinction than the epistle side, and is occupied by the clergyman of highest ecclesiastical rank who happens to be present. In some cathedrals, one of the clergy has this special duty to perform, and is designated the Gospeler.

GOSPELERS, *gŏs'pĕl-ėrz:* term of derision applied by Roman Catholics in England to Wickliffe and his followers after he had translated the New Test. into English; and afterward to all who engaged in circulating the scriptures in any but the Greek, Hebrew, and Latin languages, and reading and explaining them in the language of the people. Gospelers had a different application at the time of the Reformation, being used to describe a class of Antinomians who preached against the doctrine of predestination taught by the reformers, and led many to become lax in the conduct of their lives. Melanchthon wrote strongly against their views, Calvin warned the people not to be misled by theories on this subject, since God's decrees were secrets which men could not

penetrate, and Hooper and other writers exhorted the people against entering into 'these euriosities.'

GOSPELS: the four historical records of the Lord Jesus Christ, handed down to us from the evangelists, Matthew, Mark, Luke, and John who wrote as apostles, eye-witnesses of Christ and his work, or as recording the testimony of his apostles. From the apostolic age, these four writings have been held by the church as inspired by the Holy Spirit, and therefore authoritative. The word Gospel though not a translation from the Gr. *euanggelion* (good tidings), is its English equivalent. When this name was first applied to these records, is uncertain. The use of it in Justin Martyr, 2d c., is a subject of dispute. It appears to have been in eommon use in the 3d e.

1. *Genuineness.*—The primary and most interesting inquiry eoncerning the Gospels is as to their genuineness. They profess to be faithful records of the Lord's life—of his sayings and doings—proceeding in two eases from men who were his apostles and eompanions (Matthew and John); and in the two other cases (Luke and John), from men who, though not themselves apostles, were apostolie in their position and character, the immediate companions and fellow-laborers of the apostles. According to their profession, they all were composed during the latter half of the 1st e.; the three *Synoptic* Gospels, as the first three are ealled, probably during the decade preceding the destruetion of Jerusalem by Titus (A.D. 60-70), and the fourth Gospel (John) near the elose of the eentury. The question as to their genuineness is in the main the question as to the fact of their existence at this early period; the special authorship of each Gospel is a eomparatively less important question.

It is obvious that the existence of the Gospels within the 1st e. is a point whieh can be settled only by the ordinary rules of historical evidenee. What traces have we of their existence at this early period? As Paley illustrates the matter, we can tell of the existence of Lord Clarendon's *History of the Rebellion* at a period antecedent to Bishop Burnet's *History of His Own Times*, by the fact that Burnet quotes Clarendon. If the Gospels existed in the 1st c., therefore, we shall expect to find similar evidences of their existence in the Christian writings of the 2d and 3d e. We find sueh evidence in abundanee during the 3d e. In such writers as Origen and Cyprian, are not only quotations from the Gospels, but the Gospels themselves are mentioned by name as books of authority among Christians. From the writings of Origen alone, if all had survived, we might have eollected, it has been said, the whole text, not only of the Gospels, but almost all of the Old and New Testaments. At this point, then, there is no question. No one ean dispute the existenee of the Gospels in the age of Origen. or that immediately preeeeding—that is to say, in the beginning of the 3d. e. But as we can ascend with an al-

most equally clear light of evidence to the time of Irenæus, or the last quarter of the 2d c. The passage in which Irenæus speaks of the Gospels is so significant and important that it deserves to be extracted. 'We,' he says (*Contra Hæres.* lib. iii. c. 1), 'have not received the knowledge of the way of our salvation by any others than those through whom the Gospel has come down to us; which Gospel they first preached, and afterward by the will of God, transmitted to us in writing, that it might be the foundation and pillar of our faith. For after our Lord had risen from the dead, and they [the apostles] were clothed with the power of the Holy Spirit descending upon them from on high, were filled with all gifts, and possessed perfect knowledge, they went forth to the ends of the earth, spreading the glad tidings of those blessings which God has conferred upon us. *Matthew among the Hebrews published a Gospel in their own language;* while Peter and Paul were preaching the Gospel at Rome and founding a church there. And after their departure [death], Mark the *disciple and interpreter of Peter himself delivered in writing what Peter had preached; and Luke, the companion of Paul, recorded the Gospel preached by him. Afterward, John, the disciple of the Lord, who leaned upon his breast, likewise published a Gospel while he dwelt at Ephesus in Asia.*' These words are very explicit and to the point: and elsewhere Irenæus speaks still more particularly of the several Gospels and endeavors to characterize them in a somewhat fanciful way, which, if it proves not his own judgment, proves at least the kind of veneration with which the Gospels were regarded in his time. It is equally beyond question, then, that the Gospels were in existence in the end of the 2d c., and that they were attributed to the authors whose names they bear. 'It is allowed by those who have reduced the genuine apostolic work to the narrowest limits, that, from the time of Irenæus, the new Testament was composed essentially of the same books as we receive at present; and that they were regarded with the same reverence as is now shown to them.'—Westcott, *History of Canon.* The evidence on which we accept as undoubtedly genuine the productions of many classic authors, is not to be compared in clearness and fulness to the evidence for the genuineness of the Gospels at this stage. Any difficulties that the subject involves begin at a point higher up than this.

The age of Irenæus is the *fifth* generation from the beginning of the apostolic era—only the *third* from the termination of it. The ascending generations, as we recede from Irenæus may be characterized as (4) of Justin Martyr (3) of Ignatius and Papias; (2) of the apostle John, or the later apostolic age. It is within these three generations. and especially within the third and fourth, that the subject of the genuineness of the Gospels can possibly give any cause for hesitation and discussion.

Such writers as Justin Martyr and Ignatius nowhere quote the Gospels by name. In a fragment of Papias preserved by Eusebius, there is mention of Matthew and Mark having written accounts of the actions and discourses of our Lord; but with this exception there is no mention of the Gospels, or of their authors by name, in these earlier Christian writers. Not only so, but Justin Martyr appeals constantly to sources of information which he styles not 'Gospels' of Matthew, Luke, or John, but *Memoirs of the Apostles* (*apomnēmoneumata tōn apostolōn*). The phrase *a kaleitai euaggelia* (which are called gospels), which follows the former in the common versions of Justin's text, is supposed by many to be an interpolation. This has given rise to a good deal of discussion as to the effect of Justin Martyr's evidence on the subject. The discussion has been of this nature. Were these *Memoirs of the Apostles* our Gospels, or were they some other books of information as to Christ's sayings and doings to which Justin had access? Many German critics have been confident that these were not our Gospels; and Bishop Marsh has gone the length of saying, that Justin did not quote our Gospels. Though the question is not altogether free from difficulty, there appears no reason for doubt that the *Memoirs of the Apostles* to which Justin constantly refers were our Gospels. This seems conclusively established by the three following considerations: (1) The degree of coincidence which exists between the numerous passages which Justin quotes from his *Memoirs*, and the corresponding passages in the Gospels. The *verbal* coincidence with the very text of the Gospels is sometimes exact, and sometimes so nearly so as to appear exact in a translation. The want of entire verbal coincidence is just what might be expected in a writer like Justin, who quotes the old Testament in the same general manner, and is the very same that we find in other writers both before and after him. Further, the account which he gives of the origin of the *Memoirs* corresponds with the origin of the Gospels—viz., that two were written by apostles, and two by companions of the apostles. (2) The extreme improbability that there could have been other books beside the Gospels of the same apparently authoritative character, all traces of which have disappeared, and of which, in fact, we find no indication anywhere except in Justin Martyr. Everything tends against such a supposition. The books of which Justin speaks were read in the assemblies of the Christians on Sundays; they were regarded with respect and veneration: they were evidently held authoritative. It is wholly inconceivable, that if there were such books other than the Gospels they should not have been mentioned by other writers as well as Justin; or that they should have utterly perished. (3) The certainty, from the statements of such writers as Irenæus in the generation immediately following him, that Justin must have

known our Gospels. In this later generation we find the Gospels everywhere diffused: received and reverenced alike at Alexandria, Lyons, and Carthage; by Clemens Alexandrinus, Irenæus, and Tertullian. They could not all at once have attained this wide diffusion, or started into this position of authority. The manner in which Irenæus speaks of them can be accounted for only by the fact that he had received them from his teachers; that they had been handed down to him as inspired authorities from the first ages. We must take the light of such a statement with us in ascending to the age of Justin Martyr; and in this light it is unintelligible that the Gospels should not have been known to Justin, and consulted by him. The mere fact of his calling his authorities by the peculiar name of *Memoirs*, cannot be set against this evidence. The name of *Memoirs*, indeed, rather than Gospels, was only a natural one for this writer to use, with his classical predilections and philosophical training, and considering that he was addressing a heathen emperor, and through him the Gentile world at large. Indeed, Justin's term so admirably descriptive, of the nature and character of these writings, can be used as an argument for, more properly than against, his reference to our Gospels, whose evident purpose is to give only some *memorable* things concerning Christ.

When we ascend beyond the age of Justin to Ignatius and Papias, we find, in a fragment of the latter, as already stated, mention of Matthew and Mark having written accounts of the life of the Lord; while in the letters of the former, as in the still earlier epistle of Clemens Romanus and the so-called epistle of Barnabas —both of which belong to the 1st c., and consequently reach the apostolic age itself—we find various quotations made apparently from the Gospels. The quotations from Matthew are the most numerous. If these quotations stood by themselves, it might be doubtful how far they constituted evidence of the existence of the Gospels at this early period. They might possibly indicate merely a uniformity of oral tradition as to the sayings of our Lord; but when we regard them in connection with the position of the writers, and the whole train of thought and association in which they occur, they indicate the Gospels as written records, known and established in authority. The existence and character of such men as Ignatius and Clemens are unintelligible except in the light of Gospel history.

In addition to this chain of direct catholic evidence for the genuineness of the Gospels the fragments which have been preserved of heretical writers furnish important, and in some respects singularly conclusive evidence. The Gnostic Basilides quotes the Gospels of John and Luke about 120. The heretics appealed to them as well as the catholic writers, and this fact is a strong guarantee that no fictions or inventions could have been

palmed off on the church in the 2d c., as is virtually supposed by the most renowned German theory as to the origin of the Gospels. Upon a review of all the evidence from the apostolic fathers down to the council of Laodicea, when the four Gospels are reckoned as part of the canon of Scripture, 'there can hardly be room for any candid person to doubt,' it has been said, 'that from the beginning the four Gospels were recognized as genuine and inspired—that a line of distinction was drawn between them and the so-called apocryphal Gospels.' As a mere question of literary history, the genuineness of the Gospels certainly rests on far higher evidence than that on which we receive, without hesitation, many ancient writings.

2. *Purpose.*—The Gospels were intended not as complete biographies of the Lord Jesus, but as memoirs, or in Justin Martyr's word, *Memorabilia;* presenting him in his living personality by simple narratives of such selected scenes, acts, or words, as manifested those points of Christ's character which were prominent in the writer's thought, and necessary to make Christ known to the readers. This humbleness of aim, and this simplicity in method, give the Gospels as merely literary compositions, their unrivalled beauty and their convincing power. The source of this beauty and power, the Christian believer traces to the Divine inspiration which moved these humble men thus to set forth Christ as the Redeemer of men; so that they were the instruments of the great purpose of God's grace.

3. *Internal Character, Relation, and Comparison.*—After the genuineness of the Gospels the next point of importance is the relation which they bear to one another in respect of their contents and arrangement—the coincidences and discrepancies with one another which they present. The most obvious distinction among the Gospels as a whole is between the Gospel of John and the three Synoptical Gospels, as they are called. Matthew, Mark, and Luke, in narrating the history, discourses, and miracles of the Lord, confine themselves exclusively to what took place in Galilee until the last journey to Jerusalem. We should not know from them of the successive journeys that our Lord made to Jerusalem. John, on the contrary, brings into view prominently his relation to Judea; and of the discourses delivered in Galilee, he records only one, in chap. vi. It is obvious, at a glance, that John had a special object in writing his Gospel, an object not less *historical* in essence than the others, though dealing with a sphere larger and higher than all the histories of earth. It is probable that he purposely abstained from writing what others had recorded, and sought to bring into prominence as the basis of all Christ's life in the flesh, his life with the Father—the Word that was in the beginning with God, and was God, and had become flesh, and whose glory had been seen by many witnesses as the glory of the

only begotten son. A comparison of the three Synoptical Gospels reveals some interesting results. If we suppose them respectively divided into 100 sections, we shall find that they coincide in about 53 of them; that Matthew and Luke further coincide in 21; Matthew and Mark in 20; and Mark and Luke in 6. This, of course, applies to the substantial coincidence of fact and narrative in each case. The relative verbal coincidence is by no means so marked; it is, however, considerable, and presents some interesting features which Prof. Andrew Norton has set forth clearly in his admirable work on the *Genuineness of the Gospels*.

The result of the extremely critical and minute scrutiny to which the text of the Gospels has been subjected may be stated as follows. There is a singular coincidence in substance in the three Synoptic Gospels. 'Substantial unity with circumstantial variety,' is a saying strictly true of them—more true of them than of any other authors professing to narrate the same circumstances. The coincidence is greatly more apparent in the discourses than in the narrative parts of the Gospels most apparent in the spoken words of the Lord. At the same time, there are certain portions of narrative of great importance, that show in the several evangelists almost a verbal coincidence, as in the call of the first four disciples and the accounts of the transfiguration. 'The agreement in the narrative portions of the Gospels begins with the baptism of John, and reaches its highest point in the account of the passion of our Lord, and the facts that preceded it; so that a direct ratio might be laid between the amount of agreement and the nearness of the facts related to the passion. After this event, in the account of his burial and resurrection, the coincidences are few.' There are no parts that furnish more difficulty, in the way of formal harmony, than the narratives of the resurrection.—The apparent discrepancies between the accounts given in the different Gospels—formerly often adduced as an argument against their truthfulness—are not now so much used in that direction. Many of them indeed are even recognized as evincing utter absence of collusion among the writers, and so as tending in general to establish their truthfulness. Not one can be claimed as at all affecting any element important in the narrative; and all are of such a nature as to lose their importance with the subsidence of the merely mechanical theory of inspiration, and the growth of views more vital and spiritual.

The language of all the Gospels is well known to be Greek with Hebrew idioms, or what has been called Hellenistic Greek. The tradition, however, of a Hebrew original of Matthew's Gospel is uniform. In the fragment of Papias, and in the statement of Irenæus—the earliest sources in which we have distinct mention of the Gospels—it is plainly asserted that Matthew wrote his Gospel in the Hebrew dialect: the fact is made a mark

of distinction between his Gospel and the others. The same uniformity of tradition ascribes the Gospel of Mark to the teaching of the apostle Peter. The Gospel of Mark is the most summary of the three, yet, in some respects, it is stamped with a special individuality and originality. It describes the Lord's acts, and scenes of his life, and other acts and scenes with minutely graphic detail, throwing in particulars omitted by the others, and revealing throughout the observant eye-witness and independent historian.

4. *Origin of the Gospels.*— This is a separate inquiry from their genuineness, though intimately connected with it, and springs immediately out of those facts as to the internal agreement and disagreement of the Gospels above noted. The inquiry has been treated in an extremely technical manner by many critics, and various theories have been propounded on the subject. Generally the object of these theories has been to find a common original for the Gospels. Some profess to find such an original in one of the three Synoptical Gospels, from which the others have been more or less copied, and each of them in turn has been taken as the basis of the other two. The more elaborate theories of Eichhorn and Bishop Marsh, however, presume an original document, differing from any of the existing Gospels, and supposed to have passed through various modifications, into the threefold form which it now bears in them. It appeared to Eichhorn that the portions common to all the three Gospels were contained in a certain common document from which all three drew. It had been already assumed that copies of such a document had got into circulation, and had been altered and annotated by different hands. But Eichhorn works out an elaborate hypothesis on such a presumption. He requires for his purpose no fewer than five suppositious documents: the conditions of the problem cannot be met otherwise. These are in order: (1.) An original document; (2.) An altered copy which Matthew used; (3.) An altered copy which Luke used; (4.) A third copy made from the two preceeding, used by Mark; (5) A fourth altered copy used by Matthew and Luke in common. Bishop Marsh, following out the same process of construction, finds it necessary to increase the suppositious documents to eight. There is not the slightest external evidence of the existence of such documents; and theories of this kind, which, in order to explain difficulties, call into existence at every stage an imaginary solution, do not require serious refutation.

Another and more probable supposition is, that the Gospels sprang out of a common oral tradition. The preaching of the apostles was necessarily, to a great extent, a preaching of facts; and so zealously did they give themselves to the task of promulgating the wondrous life, works, sayings, character, and death of Christ, that they early divested themselves of the labor

or ministering to any of the lower wants of the congregations of disciples that they gradually gathered round them. It is obvious that, in the course of their active 'ministry of the word,' the facts of the Lord's life, of which they had been eye-witnesses, would gradually assume a regular outline. What the reading of the Gospels is to us, the preaching of the apostles would be to the early Christians. The sermon of the apostle Peter at Cæsarea (Acts x. 34) may give some imperfect idea of the character of this preaching. The facts thus briefly indicated would expand in frequent communication to something of the more detached and living form which they exhibit in the Gospels, or rather in what we may suppose to have been the common substratum or ground work of the Gospels. It is to be remembered that the apostles were promised that the Holy Spirit would 'bring all things to their remembrance, whatsoever the Lord had said unto them.' And this constant guidance and superintendence of the Divine Spirit would sufficiently account for the uniformity and consistency of their oral instruction, even though not reduced to writing for a considerable number of years. Allowing for the widest space of years that it may be necessary to assume before the writing of the first Gospel, the chief apostles themselves are yet living at the end of this space. It is not a mere tradition of their teaching that survives, but it is their own living witness that is circulated from church to church, as they pass to and fro in their evangelistic labors.

It is impossible to say whether this hypothesis of the origin of the Gospels be really the correct one; all we need say is that it seems to possess more probability in itself than any hypothesis of a common written source, from which they were respectively borrowed, and which has disappeared. It fits, moreover, into the facts of the case.—Westcott, *Introduction to the Study of the Gospels*, p. 189.

According to this view of the origin of the Gospels, that of Mark, if not the oldest in composition, is yet probably the most direct and primitive in form. In its life-like simplicity and comparative unconciousness of aim, it represents most immediately the apostolic preaching; it is the testimony delivered by the apostle Peter, possibly with little adaptation. Historical evidence, as we have already said, is uniform as to the association of Mark and Peter: Mark is everywhere *interpres Petri*. The Gospels of Matthew and Luke, 'represent the two great types of recension to which it may be supposed that the simple narrative was subjected: Luke represents the Hellenic, and Matthew the later Hebraic form of the tradition, and in its present shape Matthew seems to give the last authentic record of the primitive Gospel.'

A common oral Gospel also presents the most natural explanation of the accordances and variations of the three Synoptic Gospels. The words of the Lord, which

present in all such a marked uniformity, would necessarily assume a more fixed character in such an oral tradition, while the narrative surrounding them would remain comparatively free. Single phrases of a peculiar and important character would be closely retained; there would be, exactly as we find, a uniform strain of hallowed language mingling with variations in detail—a unity of tone, and even of speech, with variety of modulation and emphasis.

The development of the famous Tübingen theory of the origin of the Gospels, by F. C. Baur (q.v.), was for some time thought to mark an important epoch in critical study. He sought the cause of the difference in the characteristics of the several Gospels, not in vague myths or the fantasy of individuals, but in the dominant spiritual tendencies of the apostolic age. Needing greater scope for the influence of such tendencies, he found it by adopting the view that the latest of the Gospels, John's, was not written till about 170. The most characteristic thought of Bauer's criticism was that the Gospel of John is not a historical record, but a designedly dogmatical work, in which the historical element is but the transparent envelope of the theological truths, and is used as the artistic setting for a body of profound religious thought. The Tübingen attempt, though ingenious and interesting, is now a conceded failure; some of its leading adherents have discarded some of its prominent points. Meanwhile, Weisse, Meyer, Bernhard Weiss, and others, have developed the genuineness of Mark, deeming it the primitive Gospel and a faithful record.

Literature on the Synoptic Problem.—Gloag, *Introduction to Synoptic Gospels* (1895); Robinson, *The Study of the Gospels* (1902); Rushbrook, *Synopticon* (1880); Wright, *Synopsis of the Gospels in Greek* (1896); Hawkins, *Horæ Synopticæ* (1899); Weiss, *Markus-Evangelium* (1872); *Matthäus-Evangelium* (1876); Ewald, *Das Hauptproblem der Evangelienfrage* (1890); Wendt, *Die Lehre Jesu* (1890); Holtzmann, *Die Synoptischen Evangelien* (1863); *Einleitung in das Neue Testament* (1886); Westcott, *Introduction to the Study of the Gospels* (1895); Wright, *Composition of the Four Gospels*; Jolley, *The Synoptic Problem for English Readers* (1893); Sanday, *A Survey of the Synoptic Question* (1891); *Inspiration*, Lecture VI. (1893); Burgon, *The Last Twelve Verses of St. Mark.*

Literature of the Johannine Problem.—Thoma, *Die Genesis des Johan. Evan.* (1892); Ewald, *Das Hauptproblem der Evangelienfrage* (1890); Halcombe, *What Think Ye of the Gospels?* (1893).

GOSS, Charles Frederic, American Presbyterian clergyman: b. Meridian, N. Y., 1852, June 14. He was graduated from Hamilton College in 1873, from the Auburn Theological Seminary in 1876, and was at first a home missionary. In 1894 he became pastor of the Avondale Presbyterian Church of Cincinnati. He was also ap-

pointed to the chair of Biblical literature in Cincinnati University, and published several volumes, including *The Optimist, The Philopolist, The Redemption of David Corson, The Loom of Life* (1902); *Little Saint Sunshine* (1902); *Just a Minute* (1904); *Chickoryville Sunday-School* (1895); *Dr. Goss' New Book* (1905); etc.

GOSS, Isham J. M., American electric physician and author b. Oglethorpe County, Ga., 1819, Aug. 16; d. Marietta, Ga., 1896, Feb. 25. He graduated at Emory College, Ga., and in 1844 in medicine from the medical department of the University of Georgia. For fourteen years he followed the practice of the regular or allopathic profession, when he was converted to American Eclecticism and became a leader of that school in the South. Several Eclectic colleges conferred upon him the honorary degree of doctor of medicine. In 1868 he filled the chair of practice in the Philadelphia Medical University and in 1877 the chair of Materia Medica and Therapeutics in the Georgia Eclectic Medical College, reorganized that year. He wrote *Materia Medica* (1877); and *Theory and Practice of Medicine* (1882).

GOSS, Warren Lee, American writer: b. Brewster, Mass., 1838, Aug. 19. He studied at the Harvard Law School, served in the Civil War, first in the United States engineers and later in the 2d Massachusetts volunteers; was historian of the National Union of Ex-Prisoners of War. He has been active as editor, magazine-writer, and author of such volumes as *The Soldier's Story of Captivity at Andersonville* (1866); *Jed* (1889); *Tom Clifton* (1892); *Jack Alden* (1895); *The Recollections of a Private* (1890); *In the Navy* (1898); etc.

GOSS, n. *gŏs* [see Gorse, of which *goss* is an inaccurate spelling]: in *OE.*, furze; gorse.

GOSSAMER, n. *gŏs'să-mėr* [properly *God's summer*, so called from the legend that the *gossamer* is formed from the parts of the Virgin Mary's winding-sheet, which fell away in fragments when she was taken up to heaven]: light filamentous substance, which often fills the atmosphere to a remarkable degree during fine weather in the later part of autumn, or is spread over the whole face of the ground, stretching from leaf to leaf, and from plant to plant, loaded with entangled dew-drops, which glisten and sparkle in the sunshine—hence anything unsubstantial or flimsy. Gossamery, a. *-mėr-ĭ*, flimsy; unsubstantial. *Note.*—It is urged from a variety of considerations that the derivation of Gossamer is really *goose-summer*, from the downy appearance of the film. The Gael. name is *cleit lusan* = down on plants; *summer-eout* = summer-colt, is the Scotch for the misty exhalations seen rising from the ground in hot weather—see Skeat. Again, it is said to be the Gael. *gath*, a dart, a sunbeam; and *samhra*, summer; thus named *ga-samhra* from the resemblance of the white floating objects to rays of light—see Dr. C. Mackay. See Wedgwood for that of

the text. Various opinions were formerly entertained concerning the nature and origin of *gossamer*, but it is now ascertained to be produced by small spiders, not, however, by any single species; but by several, probably many, species; while it is also said to be produced by young, and not by mature spiders, which, if a fact, would help to account for its appearance at a particular season of the year. The production of gossamer by spiders was demonstrated first by the observations of Dr. Hulse and Dr. Lister, 17th c., but these observations were long discredited. It is not yet known whether the gossamer spread over the surface of the earth is produced by the same species of spider which produce that seen floating in the air, or falling as from the clouds. Why gossamer threads or webs are produced by the spiders at all, is also not known. That they are meant merely for entangling insect prey, does not seem probable; the extreme eagerness which some of the small spiders known to produce them show for water to drink, has led to the supposition, that the dew-drops which collect on them may be one of the objects of the formation of those on the surface of the ground, while it has been also supposed that they may afford a more rapid and convenient mode of transit from place to place than the employment of the legs of the animal. As to the gossamers in the air, conjecture is still more at a loss. They are certainly not accidentally wafted up from the ground, as might be supposed; the spiders which produce them are wafted up with them; but whether for the mere enjoyment of an aërial excursion; or in order to shift from place to place, is not clear, though the latter supposition is most probable. The threads of gossamer are so delicate that a single one cannot be seen unless the sun shines on it; but being driven about by the wind, they often become beaten together into thicker threads and flakes. They are often felt on the face when they are scarcely visible. The spiders which produce these threads shoot them out from their spinnerets; a viscid fluid being ejected with great force, which presently becomes a thread; sometimes several such threads are produced at once in a radiating form, and these being caught by the ascending current of heated air, are borne up, and the spider along with them. It has been said that the spider has even some power of guiding in the air the web by which it is wafted up.

GOSSAN, n. *gŏz'zăn:* among *Cornish miners*, the peculiar ferruginous condition of the top of a vein near its out-crop, considered to be very strongly indicative of the lode below; ferruginous quartz.

GOSSART (or GOSSAERT), JAN DE (known as MABUSE): about 1499–1562; b. Maubeuge, Hainaut, Belgium: painter. Little is known of his early life except that he became a member of the guild of St. Luke in Antwerp 1503. He is supposed to have studied painting in Italy, and practiced it some years in Ant-

werp. Subsequently he visited England; took service with Philip of Burgundy, with whom he travelled in Italy, Spain, and Denmark; and at Philip's death retired to Middleburg in the service of Philip's brother Adolph. His most celebrated painting was *The Deseent from the Cross,* containing 50 figures, ordered for the high altar of the monastery of St. Michael of Tongerloo, Middleburg, and destroyed by fire 1568. Other noted ones were: *The Wise Men's Offering,* secured for the collection of the Earl of Carlisle; *Neptune and Amphitrite* (1516); several *Madonnas; Adam and Eve; St. Luke Painting the Portrait of the Virgin; Christ and His Scoffers;* and portraits of Leonora of Portugal, the children of the king of Denmark, several of the royal family of England, and many persons of distinction in the reign of Henry VIII. Gossart delighted in strongly contrasted colors, and often employed elaborate architectural backgrounds. Many of his figures were stiff and conventional; but in some there is a quiet dignity.

GOSSE, *gŏs,* Edmund William, English literary critic and poet: b. London, 1849, Sept. 21. He is a son of P. H. Gosse (q.v.). From 1875–1904 he was translator to the Board of Trade and since 1904 has been librarian to the House of Lords. In 1884–5 he was engaged on a lecturing tour in the United States. He has made a special study of Scandinavian literature, and has published *Studies in the Literature of Northern Europe* (1879). Other works of his are: *Life of Gray* (1882); *Seventeenth Century Studies: a Contribution to the History of English Poetry* (1883); *From Shakespeare to Pope: an Inquiry into the Causes of the Rise of Classical Poetry in England* (1885); *Life of Congreve* (1888); *History of Eighteenth Century Literature* (1890); *Life of Philip Henry Gosse, Naturalist,* (1890); *Gossip in a Library* (1891); *Questions at Issue* (1893); *The Jacobean Poets* (1894); *Critieal Kit-Kats* (1896); *History of Modern English Literature* (1897); *Life and Letters of Dr. Donne* (1899); *Illustrated Reeord of English Literature* (Vols. III. and IV., 1903); *Life of Jeremy Taylor* (1904); *Freneh Profiles* (1905); *Coventry Patmore* (1905); etc. He has written a romance, *The Seeret of Narcisse* (1892); and several volumes of poems: *Madrigals, Songs and Sonnets* (1870); *On Viol and Flute* (1873); *King Erik,* a tragedy (1876); *The Unknown Lover,* a drama (1878); *New Poems* (1879); *Firdausi in Exile and Other Poems* (1886); *In Russet and Silver* (1894); *Collected Poems* (1896).

GOSSELIN, Honore Auguste: French Canadian author: b. St. Charles de Bellechasse, Quebec, 1843. He was educated at Quebec Seminaire and graduated from Laval University in 1863; ordained priest 1866 and became chancellor of Quebec Diocese. His works include: *Tablettes Chronological es de l'Histoire du Canada* (1887); *Vie de Mgr Laval* (2 Vols. 1890); *Les*

Normands du Canada (1892–4) *Sacerdotal Jubilee of Cardinal Taschereau* (1892); *Vie de Jacques Labrie* (1893); *Observations apropos de P. P. La Jeune et de M. de Ineykus* (1896); *Henri de Bernières 1st Curé of Quebec* (1905); *Jean Licolet et le Canada de Son Temps* (1905).

GOSSIP, n. *gŏs'sĭp* [AS. *Godsibb*, related in God as a sponsor in baptism, a gossip—from *god*, God; *sib*, place, relationship: Ger. *sippe*, affinity: Goth. *sibja*, relationship]: originally, a sponsor, a neighbor, or friend; an idle tattler; a busy teller of news; small-talk; scandal: V. to run about among neighbors and engage in idle talk; to engage in much small-talk; to tattle. GOS'SIPING, imp. GOS'SIPED, pp. *-sĭpt*. GOS'SIPRY, n. *-rĭ*, special intimacy; idle talk. GOS'SIPY, a. *-ĭ*, full of gossip; chatty.

GOSSOON, n. *gŏs-sôn'* [Ir.: F. *garçon*, a little boy]: in *Ireland*, a big, clumsy boy; a lad in a great house employed in menial kitchen-work, and as a messenger.

GOSSYP'IUM. See COTTON.

GOT, *gō*, FRANCIS JULES EDMUND: comedian: b. Ligne-rolles, Orne, France, 1822, Oct. 1. He was educated in Charlemagne College, employed at the prefecture of the Seine, entered Provost's class at the Conservatory 1841, took the second prize for comedy 1842, and the first 1843, served in the army one year, and made his first appearance on the stage at the Comédie Française, Paris, 1844. He became a sociétaire 1850, has played a great number of parts in the old classical dramas, and created scores of original characters in modern pieces, and as prof. of the Conservatory had the cross of the Legion of Honor publicly conferred upon him 1881, Aug. 4.

GŌ'TA: river in Sweden. See GOTLAND.

GO'TAMA. See BUDDHISM.

GOTH, n. *gŏth* [L. *Gothi;* Gr. *Gothoi*]: one of an anc. tribe or nation which took an important part in the overthrow of the Roman empire (see GOTHS), any one rude and uncivilized; an enemy to the fine arts, or one destitute of a taste for them.—*Vandal* is also employed in the latter sense. GOTH'IC, a. *-ĭk*, of or belonging to the Goths or their language; designating the architecture of the middle ages (see below). GOTH'ICIZE, v. *-ĭ-sīz*, to reduce to barbarism. GOTH'ICIZING, imp. GOTH'ICIZED, pp. *-sīzd*. GOTH'ICISM, n. *-sĭzm*, rudeness of manners; a Gothic idiom; conformity to Gothic architecture. *Note.*—The *Ostrogoths* and *Visigoths*—that is, the *East-Goths* and *West-Goths*—were names applied to those who settled on or near the Black Sea and up to and on the Danube; the *Mœsogoths* were those who settled in Mœsia; the *Suio-Goths* were those who settled in Scandinavia.

GOTHA, *gō'tâ:* town of Germany, cap. of the duchy

of Saxe-Coburg-Gotha, on an elevation in a beautiful district on the right bank of the Leine, 18 m. w. of Erfurt, by the Thuringian railway. It is a handsome, well-built town, is quadrilateral in form, and was formerly surrounded by walls, which have been thrown down, and public walks laid out in their place. The principal public building is the large ducal palace of Friedenstein, with two large side-wings, and two towers 144 ft. in height. This palace contains a picture-gallery, in which Cranach, Van Eyck, Holbein, Rubens, and Rembrandt are represented; a cabinet of engravings (very valuable); a library (founded by Ernst the Pious 1640) of 170,000 vols. and 6,000 manuscripts (2,000 Arabic); a cabinet of Egyptian, Roman, Greek, and German antiquities; a collection of about 80,000 coins and 13,000 medals (one of the finest collections in Europe), and a Japanese and Chinese museum. Gotha has also an arsenal, a new and old town-hall, and numerous educational and benevolent intitutions. The principal manufactures are porcelain, colored paper, cloth, tobacco, sugar, toys, machinery, musical and surgical instruments, etc. Gotha sausages have a widespread celebrity. Pop. (1900) 34,651.

GOTHA, ALMANACH DE: universal political register, published annually at Gotha (q.v.). The publication began 1764, in the German language, in which it was continued until Napoleon I. became emperor, when it was changed to French: it has recently been published in both tongues. The almanac is a small pocket volume, containing nearly a thousand pages of small type, and recording the sovereigns and royal families of every civilized country, with the civil, diplomatic, military, and naval officers, a great amount of statistical information; a compact summary of historical events, obituary notices of the most distinguished persons, and other matters of political interest. The boundaries of states are given according to the latest treaties, with their extent, population, and revenues. The *annuaire diplomatique* contains the name of every diplomatic representative and *attaché* of Europe and America. The pay of officers of governments, national expenditures and debts, with the interest, the number of representatives, under representative governments, and their proportion to the population, are carefully given. As a work of such an extent cannot be brought down to the end of the year, the date of publication is stated, and in some instances a date has been given to each page, as completed, to show that the editor is not answerable for subsequent changes. When the *Almanach de Gotha* was commenced, there was but one republic in existence —that of Switzerland. It was then little more than a register of the crowned heads and royal families of Europe. It has been slow to recognize political changes, and for years after the French Revolution, continued to print under the head of 'France,' Louis XVII. as

the reigning monarch. It was not until Napoleon became emperor that his name found a place in its pages, and then his whole family was given, as with the other royal houses. During the empire, Napoleon I. considered this little publication so important, that he exercised over it a rigid supervision, and in 1808, an entire edition, which had just been worked off, was seized because Anhalt took precedence of Napoleon. To secure this re-arrangement of the alphabet, the edition of that year was printed at Paris. It is probable that a similar supervision of the press kept out of the historic pages the successes of the allies against the empire in the succeeding numbers, in which there was no mention of the campaigns of the Peninsula, and the victory of Trafalgar. On the restoration of the Bourbons, however, these events were recorded in a *resumé*.

GO'THA, DUCHY OF. See SAXE-COBURG-GOTHA.

GOTHARD, *gō-târ'*, ST.: mountain group in the Helvetian Alps, reaching in its highest peaks 12,000 ft.: see ALPS. St. Gothard is famous chiefly for the pass over the Alps, 6,800 ft. in height at its summit. Through this pass, the high-road from Fluelen, on Lake Lucerne, is carried without interruption in a s.s.e. direction to Lake Maggiore, in n. Italy. The road over the pass, made 1820–32, was in great part destroyed by violent storms 1834 and 39. Since that time, however, it has been in good condition. It is one of the best and most convenient of the Alpine carriage-ways, is free from snow for four or five months of the year, and is remarkable for the grandeur of its scenery. In 1870 Germany, Italy, and Switzerland signed an agreement for the construction of a railway with a tunnel through the St. Gothard. The chief difficulty in the way of apportioning the expense was removed 1879, when the Swiss confederation agreed to bear part of the burden with the several Swiss cantons through which the line passes, and the two Swiss railways. Operations were begun 1872, Oct.; the workings from opposite sides met 1880, Feb. The length of the tunnel, the greatest undertaking of the kind attempted by man, is 9¼ m.; cost, estimated at more than £9,000,000.

GOTHENBURG. See GOTTENBORG.

GOTHENBURG SYSTEM: a system that originated in Gothenburg, Sweden, for regulating the liquor traffic. Its chief features are the doing away with private gain from the sale of spirits, the placing of public houses under the charge of state agents, and the use of the profits for public improvements. This system went into effect in Norway 1896. Spirits are not allowed to be retailed before 8 A.M. or after 1 P.M. on Sundays and holidays and on the days preceding them. While it has been asserted by some that under this plan the liquor trade has been kept within bounds and that public morals have been improved, others declare that there is no

material abatement of the evils of the licensed saloon. In Norway the communal organizations determine the number of places at which spirits shall be retailed, and the choice of a manager for each of such places has to be approved by the local municipality.

GOTHIC: a term used by American printers to describe a style of square-cut printing-type very similar in appearance to the old Roman mural letter. In England this type is known as the 'grotesque.'

GOTHIC ARCHITECTURE: various styles of architecture which prevailed in w. Europe from the middle of the 12th c. to the revival of classic architecture in the 16th c. The term *Gothic* was at first bestowed by the Renaissance architects on the mediæval styles as a term of reproach. This epithet they applied to every kind of mediæval art which had existed from the decline of the classic styles till their revival, all other styles being by them considered as *barbarous* and *Gothic.* The name has now, however, become generally adopted, and has outlived the reproach at first implied in it. It has also become limited and defined in application. During the present century, the arts of the middle ages have been attentively studied, and their origin and history carefully traced; and as the knowledge of these styles has increased, a feeling of admiration has succeeded to that of contempt, and Gothic now ranks as one of the noblest and completest styles of architecture ever invented.

Origin.—The origin of Gothic architecture has given rise to many very ingenious speculations. It has been said that the style was copied directly from nature; that the pointed arches and groins of the vaults were imitated from the overarching branches of trees; and that the stems of an avenue were the originals of the pillars of the Gothic aisles. Others have strenuously maintained that the invention of the pointed arch was a mere accident, arising from this form having been observed in the interlacing of the circular arches of a Norman arcade. It has also been stated that the style was imported from the East during the Crusades and that the mediæval architects had but little to do with its origin. More careful study of the Gothic buildings which remain to us, has dispelled these fanciful ideas, and settled the origin and progress of the art on historical as well as internal evidence. To trace Gothic architecture up to its primary elements, we should have to go far back in the world's history. Some maintain that there are only two styles of architecture of which we have any knowledge—viz., Greek and Gothic; that these are the two typical styles, and that in them are contained all the elements of which all other styles are composed. This is no doubt to some extent true, as it is also true that all things in nature are derived from a few primary elements. But as there are many varieties in nature, so there are many developements of the two

typical forms of architecture, all of which deserve to be classed as styles.

Greek architecture is the type of **the trabeated style**—i.e., the style whose principal feature is **the straight** lintel; Gothic is the type of arcuated architecture, in which the voids are spanned by arches. Of these typical forms there are many varieties. Roman architecture (q.v.) is the transition form between them. The Romans adopted the Greek form of decoration and the Gothic form of construction; they decorated their exteriors with columns crowned by straight architraves and cornices, and inside these they formed the real construction with arches and vaults. The use of the latter gradually extended, especially in the construction of interiors, and by means of vaults the Romans were able to roof in large areas without encumbering the floor with pillars. This was found to be a very advantageous system of construction, and was carried out in many important instances, e.g., in the baths of Caracalla and Diocletian (see BATHS), the Basilica of Constantine, etc. In their works of public utility, where use, not decoration, was the chief object, the Romans always adopted the arch as the fittest mode of construction—as in their aqueducts (q.v.), bridges, etc. The arch thus came gradually more and more into use; and about the time when the barbarians first overran the provinces, the arcuated form of construction was universal, and some attempts had been made to conform the Greek decoration to the circular arches by bending the entablature round the curve—as in the palace of Diocletian at Spalato, in Dalmatia.

To the Romans, therefore, is due the introduction of an arcuated construction with a well-developed internal, and a partially developed external decoration. The early Christians adopted their forms of construction and decoration from the Romans. They were indebted to them also for the plans of the buildings, which became the types of the Christian sacred edifices during the middle ages. The Basilica (q.v.), or Roman court-house and market-place, was found to be admirably adapted for early Christian worship, and the circular temples were the prototypes of the Christian Baptisteries (q.v.) which usually accompanied the basilicas. In erecting their buildings, the Christians not only adopted the plans and mode of construction, but used the actual materials of the buildings of the Romans, many of which had been destroyed by the barbarians. Where such materials were abundant—as in Rome and Central Italy—the early Christian architecture very closely resembled that of the Roman buildings which had preceded it. But in more remote districts the builders, finding no ready-made materials at hand, had to design and prepare new ones. In doing so they followed as closely as they could the Roman originals, but their buildings partook more of the constructional

than the decorative elements of Roman architecture. The Roman ornament thus dropped out of use; and when, in process of time, decoration was desired, each new people followed its own ideas. The traditional Roman decoration thus became to a great extent lost, and new styles introduced. These new styles each retained some of the original Roman forms and modes of construction; and each style depended for its peculiar character on the particular Roman forms that it retained and developed. Thus Constantine, and the architects of the East, seized upon the *dome* as the distinguishing feature of their style, and the architects of Lombardy adopted the plain tunnel-vault. The former style is called Byzantine (q.v.), and has been the type of all Eastern mediæval architecture; and the latter Romanesque (q.v.), and has been the origin of all the western architecture of mediæval Europe.

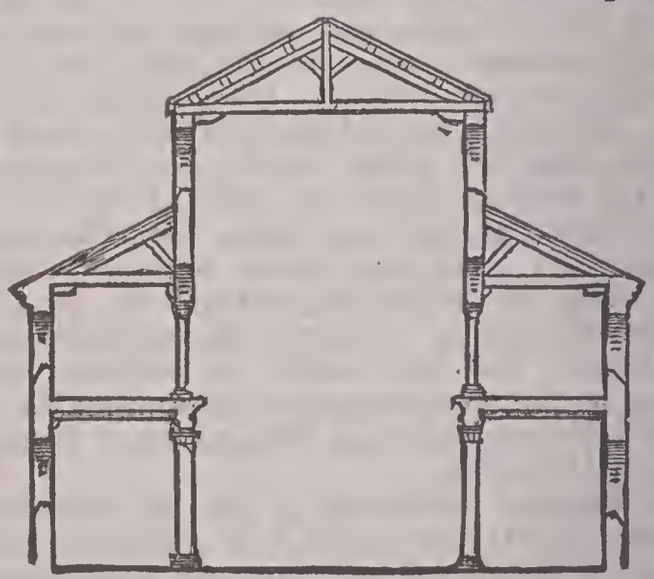


Fig. 1.

History.—From Lombardy—in those ages part of the German empire—the Romanesque style readily passed into Germany and Switzerland, and was also most naturally adopted in s. France, where examples of Roman architecture abounded. This architecture was carried out with various modifications in these different countries, all of which may have contributed to the general progress of the art; but as might be expected, it is to the banks of the Rhine where the successors of Charlemagne chiefly dwelt, that we must look for the first step in the development of Gothic architecture. A glance at the development of vaulting will show how this occurred.

The Roman basilicas, and like them, the early Christian churches (Fig. 1), were divided into a central nave with two aisles (often called side-aisles), the nave separated from the aisles by a row of columns on each side. These columns carried arches on which rested the side-walls of the nave, which were carried sufficiently high

to clear the roofs of the aisles, and admit windows to light the central nave. This row of windows afterward became the Gothic Clerestory (q.v.). The apse at the end of the nave was semicircular on plan, and was usually roofed with a vault in the form of a semi-dome. This feature also was afterward more fully developed in the chapels of Gothic churches. The nave and aisles were originally roofed with wood, but, owing to their frequent destruction by fire, it became necessary to cover the churches with a more enduring construction. Vaulting was then introduced, the Roman forms, of which many examples existed, being at first closely followed. To trace the progress of vaulting from the simple tunnel-vault of the Romans to the fully developed and magnificent groins of Gothic cathedrals, is a most interesting inquiry; and, indeed, includes the history of the development of Gothic architecture. There is one consideration which will help to explain how the Roman arches were abandoned and new forms sought out. To the Roman emperors who built the splendid vaults of the baths, and who had a subdued world at command, *materials* and *labor* were a small consideration. They could, therefore, afford to build

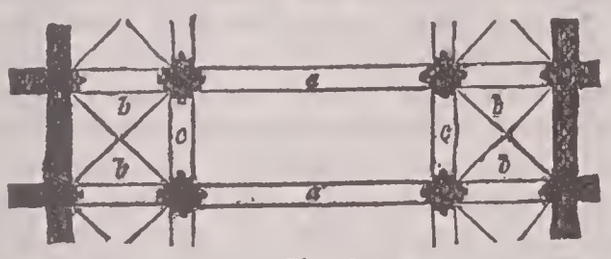


Fig. 2.

in a style which required perfect materials and workmanship. But mediæval princes and bishops could obtain neither except at great cost and trouble; to economize these, therefore, great skill and attention were required. It was necessary to study to avoid those large and expensive materials of which the Romans were so lavish, and to adopt the simplest and easiest forms of construction.

The first vaults tried were simple semicircular tunnel-vaults. It was found that these, besides being very gloomy, required very massive walls to resist their thrust. An attempt was then made to relieve this thrust by *transverse arches* (*a*, *a*, Fig. 2) thrown across —at intervals—under the tunnel-vault, to act as strengthening arches. Buttresses with a slight projection were applied outside to support these, and a beam of wood was sometimes introduced at the wall-head from buttress to buttress to assist in opposing the thrust of the vault. This was the first attempt to throw the weight of the vault on single points. In the aisles, where the span was small, the Roman intersecting vaults (*b*, *b*, Fig. 2) were used; and as the roofs with tunnel-vaulting were found very gloomy and ill-lighted, it was

desirable that similar intersecting vaults should be used to cover the main roof, in order to admit windows raised to light the vaulting. But how was this to be managed with the small materials at command? If the transverse arches AB, CD (Fig. 3) are semicircular, and the side-arches AC, BD the same—the vault being formed by two intersecting cylinders—then the intersecting groins AD and CB must be elliptical. This was a difficult form of construction: the mediæval builders found it easier to construct semicircular groin arches with radius EA (Fig. 4), and to fill in the triangular

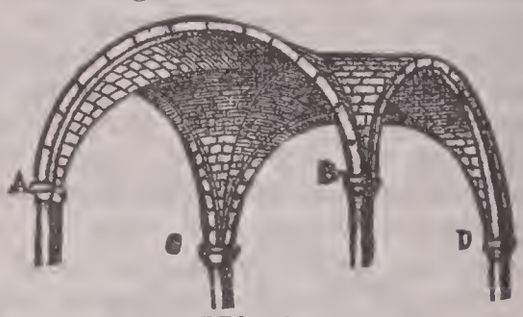


Fig. 3.

spaces ABE, etc., with slightly domed vaults. Here, then, we have the origin of the groin-rib, the development of which formed so important a part in Gothic vaulting. When the space to be covered was square, this form of vault was found satisfactory, and usually included two bays of the side-aisles. But this arrangement looked awkward externally, the windows of the clerestory not grouping well with those of the aisles. A transverse arch (*a*, *a*, Fig. 4) was then introduced, carrying up the design from the nave piers to the vaulting. This form of vault is called hexapartite. All the

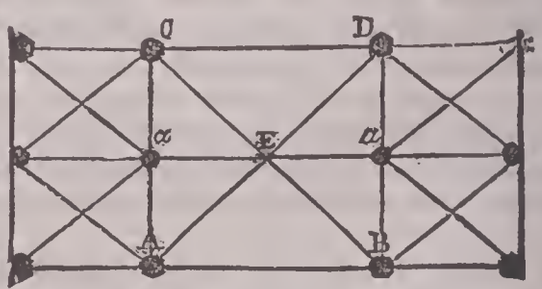


Fig. 4.

above forms of vaulting were fully developed in the round arched styles of the Rhine.

In France, also, these forms were tried; but it was found that the semicircle is not a good form of arch unless loaded on the haunches, many of the churches which were vaulted in this manner during the 11th c. having to be buttressed or rebuilt in the 12th and 13th c. In s. France (where the Byzantine influence had been strongly felt, through the Mediterranean commerce), the pointed tunnel-vault (Fig. 5) had been long in use, and had superseded the semicircular tunnel-vault probably as early as the 9th or 10th c. This form of arch was thus

probably suggested to the architects of n. France, who at once saw how well it would overcome the difficulty of the yielding of the haunches in the semicircular arch. They were thus led to the adoption of the pointed form for their transverse arches *as a structural expedient*, and still retained the semicircular form in the groins. The next question which engaged attention, and the solution of which led to the further use of the pointed arch,

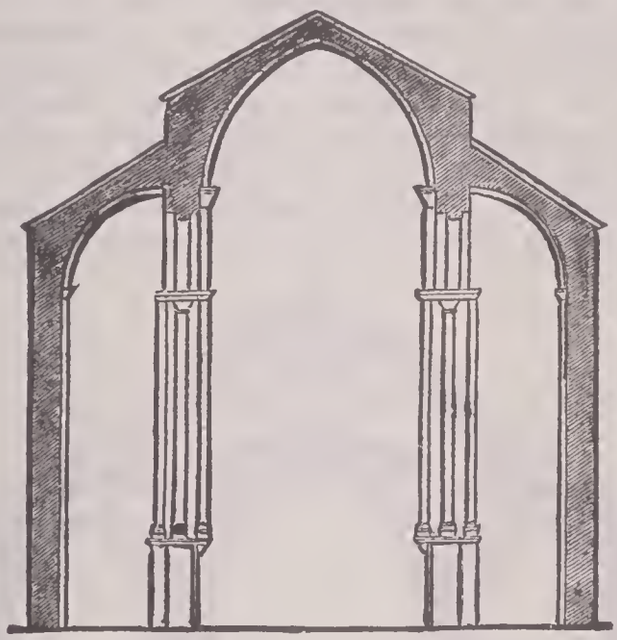


Fig. 5.

was the vaulting of oblong spaces. This had been tried with semicircular arches, but it was found that in this way the vault would require to be very much domed—the diameter of the arches (*c c* Fig. 2) being so much smaller than that of *a a*—whereas by using pointed arches, of different radii, for the transverse and side arches all might be kept at about the same height (Figs. 6 and 7). This is more fully explained by Fig. 6. If AB be the diameter of the transverse arch (*aa*), and

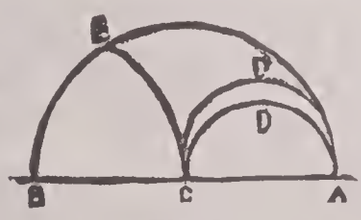


Fig. 6.

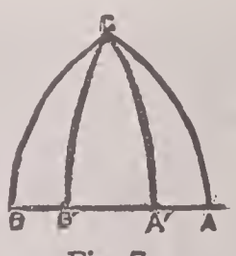


Fig. 7

AC that of the side arches (*cc*), it is clear that the semicircular side arch ADC cannot reach the height of the transverse arch AEB, even when stilted as at D′. But in the pointed arch, CEB, the same diameter rises to very nearly the height of the transverse arch. The pointed arches ACB and A′CB′ (Fig. 7) show how easily arches of this form, whatever their diameter, can be built of the same height. By the introduction of this new form of arch the vaulting was strengthened, and the

thrust brought to bear steadily on single points. Thus may be traced the history of vaulting from the time of the Romans to the 12th c., when the principles of Gothic pointed vaulting were fully developed; and we have dwelt particularly on this subject, because it includes the principles which regulated the whole of the Gothic style. Gothic architecture was not the invention of an individual, but a necessary growth—a gradual development from structural requirement. This is clearly the case with regard to the vaulting, as we have traced it above, and the same might be proved regarding every member of the style. Thus it might be shown how the ribs became gradually more decided, expressing the part that they bore in the support of the roof; how the nave piers (q.v.) were gradually subdivided into parts, each shaft bearing on a separate cap a separate portion of the

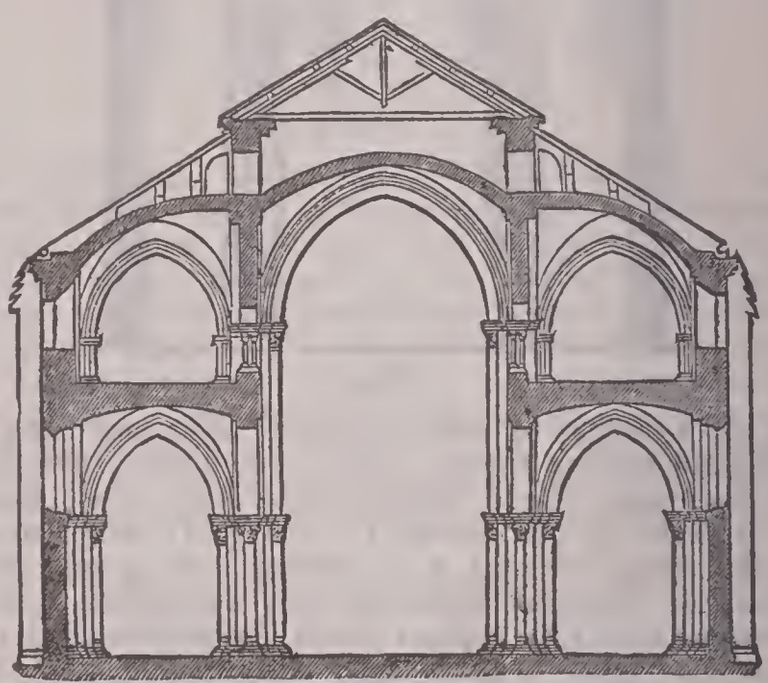


Fig. 8.

vaulting; how the buttresses were developed as they were required to resist the thrust of the groins concentrated on points; and how the flying buttresses were forced on the Gothic architects much against their will, as a mode of supporting the arches of the roof.

The history of the flying buttress is curious. The thrust of the tunnel-vault was sometimes resisted by half tunnel-vaults over the side-aisles (see Fig. 5). These, therefore, required to be high, and a gallery was usually introduced. In the Narthex at Vezelay (Fig. 8) we have this gallery with the vaulting used as a counterpoise to that of the nave. This is a fine specimen of vaulting in the transition state, the vaulting of the gallery resists the main vault, as in Fig. 5, and is at the same time groined. This leaves a somewhat weak point opposite the transverse arches, and to strengthen such points, flying buttresses are introduced, which timidly

show themselves above the roof. The galleries were, in later instances, dispensed with to admit of larger clerestory windows, and the flying buttresses were left standing free. The architects finding them indispensable, then turned their attention to render them ornamental. *Pinnacles* may also be shown to owe their origin to their use; they acted as weights to steady the buttresses and piers. Under the separate heads it will be shown how each element of Gothic architecture was in the strictest sense constructional, the decoration being in harmony with its actual use, or as Pugin has said, 'decorated construction not constructed decoration.'

The full development of Gothic vaulting, the forerunner of the whole style, was first carried out in the royal domain in France about the middle of the 12th c. The Normans had settled in n. France more than a century before this, and had applied their talents and the fruit of their conquests to the building of splendid temples in honor of their victories. In doing so, they followed out the round-arched style, and brought it forward by a great stride toward true Gothic (see NORMAN ARCHITECTURE). South of the royal domain, in Burgundy, there had existed for centuries great establishments of monks, famous for their architecture. The Abbey of Cluny was their central seat, whence they sent out colonies, and built abbeys after the model of the parent one. The style in which they worked was also an advanced Romanesque, but different from that of the Normans. Between these two provinces lay the royal domain. Owing to the weak state of the kingdom, architecture had hitherto made little progress in the isle of France. About the beginning of the 12th c. the monarchy revived, and for the next two centuries was governed by wise and powerful monarchs, who succeeded in re-establishing the royal supremacy. A new impulse was thus given to the literature and arts of the country, by which architecture profited largely. From the state of ruin into which the kingdom had fallen, there were almost no churches existing worthy of the new state of things. New and great designs were formed: hitherto, almost all the important churches of France were abbey churches; now, under the royal patronage, cathedrals were to be built. The bishops, envious of the power of the monks, lent their powerful aid, and the laity joined heartily in the work. With such a universal impulse, architecture took a great stride, and new forms were introduced. It is to this period and people that we owe the development of the true or pointed Gothic style.

We have already seen at Vezelay how nearly the Burgundian monks had approached to Gothic. To complete the development, it required only the side-walls and vaulting of the nave to be raised, so as to admit of windows over the roofs of the side galleries; and the flying buttresses to be raised with them, so as to receive the the thrust of the vault—the latter being constructed

with pointed groin ribs, and the side and transverse arches carried to the height of the groins. The laic architects of the royal domain soon accomplished this step, and the new style sprang up and advanced with astonishing rapidity. The earliest example that we have of the fully developed Gothic style is the cathedral of St. Denis, in which are deposited the remains of the kings of France. It was founded by the Abbé Suger 1144. The cathedral of Notre Dame of Paris soon followed and almost contemporary with it arose the magnificent cathedrals of Chartres, Rheims, Amiens, Beauvais, Bourges, and many others.

Another cause which tended to hasten the progress of the style, was the invention about the same time of painted glass. The Romanesque architects had been in the habit of decorating their churches with frescoes and other paintings; but this new mode of introducing the most brilliant colors into their designs was at once seized on by the northern architects. The small, circular-arched windows, which were still in many instances retained long after the pointed-arch had become usual in the vaulting, no longer when filled with stained glass, sufficed to light the churches. They were therefore enlarged, two or even three were thrown into one, divided only by mullions; this compound window was again increased until the compartment of the clerestory became almost wholly absorbed. The architects were then forced to conform the arches of their windows to the pointed outline of the side-arches of the vaulting. The desire for more and more space for stained glass was the origin of the window-tracery, which forms so beautiful a feature of the style. It is the last attenuated remainder of the wall space of the clerestory, which was at last entirely absorbed.

Fig. 9, from Notre Dame, is a good illustration of the progress of French Gothic architecture. The left-hand portion of the elevation shows the mode of fenestration adopted. The clerestory windows are small; and, in order to give more light, the vault of the gallery next the window is kept very high. This was the original design; but during the construction of the cathedral, the importance of stained glass had become so great, that the design was altered to give larger windows for its display, as shown on the right-hand portion of the elevation. These windows also show the simple early forms of tracery; that in the aisle windows being later and more advanced. Fig. 10 shows two bays from Tournay cathedral, and is a good specimen of the mode in which the whole space of the side-walls was made available for window tracery and stained glass.

The further history of Gothic architecture in France is simply the following out, to their furthest limits, of the principles above indicated, on which the early architects had unconsciously been working when they originated the style. So long as the Gothic architects worked

on these principles, they advanced and improved their architecture. When, however, the style had become fully developed and matured (about 1300), the spirit of progress died. No new features were developed. The architects seemed to think that in its main elements their style was complete, and contented themselves with continuing the traditional style of their forerunners, pushing to extreme limits the principals handed down to them. Thus, the height of the cathedrals was extended till, at Beauvais, it exceeded the power of the architects to prop up the vaulting. The system of buttresses and pinnacles was developed with the utmost skill, till at last the original simplicity and repose of the designs were lost, and the exteriors presented an elaborate system of scaffolding and propping-up stone. The beauti-

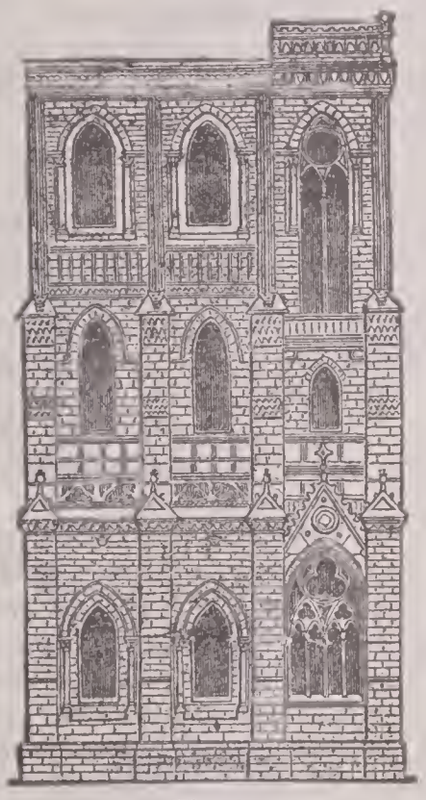


Fig. 9.

Fig. 10.

ful forms of the early tracery became distorted into all manner of flowing curves, graceful but unmeaning, of the Flamboyant period (q.v.); and, in short, the art became lost in mere cleverness of design and dexterity of execution, and the architect's place was usurped by the freemason. It is in the cathedrals of the 12th and 13th c., above referred to, that we find the noblest development of the Gothic style. Everything tended to make them so. The nation was united in the effort—all the science, all the arts, all the learning of the times were centered in the church. In it, and that almost exclusively, the sculptor, the painter, the historian, the moralist, and the divine, all found scope for the expression of their ideas on the sculptured walls, porches, and niches, or the painted windows of the cathedrals—the churches of the people.

The progress of this style in other countries is no less remarkable. At no time in the world's history did any style of architecture ever spread so wide, or give rise, in so short a time, to so many splendid buildings. No sooner had the style been invented in central France, than it immediately spread over the whole of w. Europe, superseding all other styles, and everywhere producing similar splendid buildings wherever it went. In England, Germany, and Italy, the Gothic style had some peculiarities. It spread also over s. France, and Spain; but the latter countries have not yet been fully illustrated.

English Gothic.—The Normans introduced their round-arched style at the Conquest 1066, and there are some fine specimens of this style in England and Scotland—St. Cross, Hampshire; Durham cathedral; Kelso and Jedburgh abbeys, etc. But these buildings are not copies of those of Normandy. The English have always, in adopting styles, given them a national impress. As it was with the Norman, so to a still greater degree with the pointed Gothic. This was introduced into England about 1174, by William of Sens who superintended the rebuilding of Canterbury Cathedral. The English architects soon began to develop a pointed style of their own. They borrowed much from France, and worked it out in their own way, forming what is now called the *Early English* style. The differences between the early Gothic of France and England extend to almost every detail. The moldings, bases, caps, pinnacles, buttresses, and foliage of the latter all are impressed with the early English feeling. In France, the feeling of the early Gothic is one of unrest—a constant struggle forward. In England, the effort for progress is not so marked—that of carefulness and completeness prevails. In the *plans* of the cathedrals the differences are marked (see Figs. 11, 12), as the accompanying plans of the cathedrals of Salisbury and Amiens show. The termination of a French cathedral or church is invariably circular ended or apsidal—a form derived from the circular tomb-house or baptistry, which in early Christian times was built separately, and afterward taken into the cathedral. The English cathedral, on the contrary, is almost always square ended. The French transepts have almost no projection; the English ones have great projections—Salisbury and Canterbury having *two* transepts. The French cathedrals are short and very lofty; the English, long and comparatively low. The French buildings are perhaps the grandest and most inspiring, the English the most finished and picturesque. The exterior of the chevet was a difficulty with the French and Germans, and, as at Beauvais and Cologne, resembles an intricate and confused mass of scaffolding. This difficulty was avoided by the English square ends, which afforded scope for the very English arrangement of the 'Five Sisters' at York, or for a large field of stained

glass in a single window. The western portals of the French cathedrals, such as Rheims and Amiens, are among the boldest and most magnificent features of their architecture. In these the English were not far behind, as the western portals of Peterborough and York

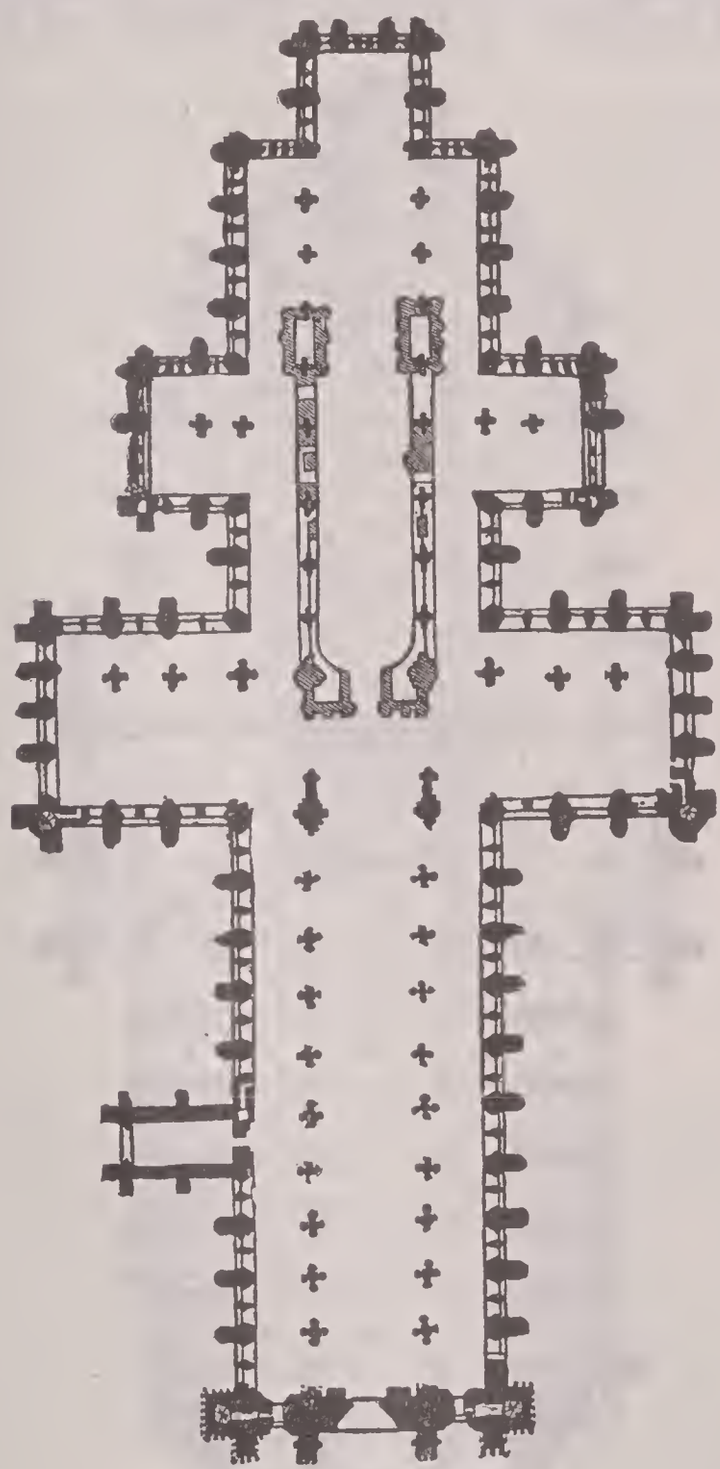


Fig. 11.—Salisbury Cathedral.

show. The outlines of the English cathedrals are usually very picturesque and well balanced, the western towers grouping harmoniously with the central, and in this respect the English have the advantage.

In the application of vaulting, the English carried out their own ideas. They always inclined to prefer wooden

roofs; probably this led to the invention of the many beautiful kinds of vaults which form so fine a feature of English Gothic (see VAULTING; FAN-TRACERY). In England the style lasted longer than on the continent.

The Germans were nearly a century in adopting the pointed style after its invention in France; and when it

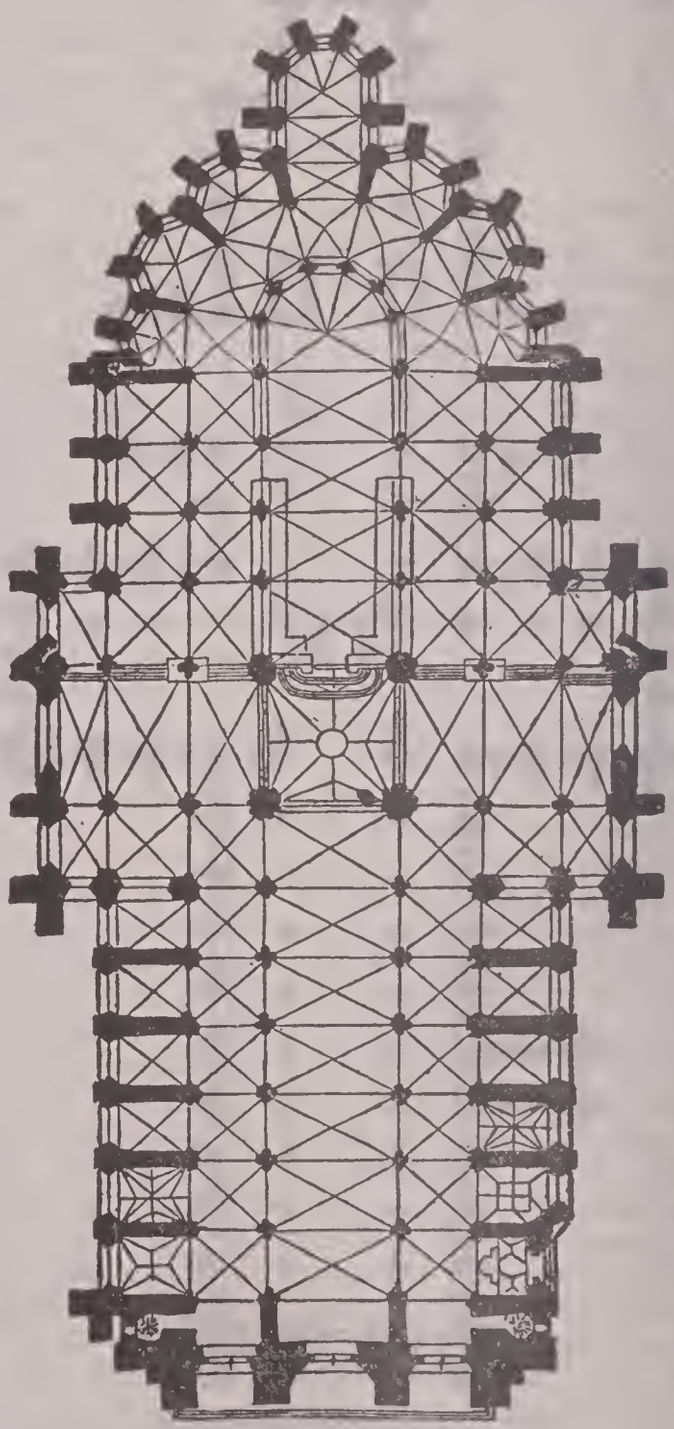


Fig. 12.—Amiens Cathedral.

was introduced, it retained the appearance of a foreign importation. It never was so completely naturalized as in England. The so-called beauties of the German Gothic are, for the most part, to be regarded rather as excellent specimens of masonry than as artistic developments of the style. The open-work spires, for example, are fine

pieces of construction, and have a striking effect; but from the first there is a tendency to commit the work to masons, who rejoice in displaying their manual dexterity. The later Gothic in Germany is the most splendid development of the stone-cutter's art and the draughtman's ingenuity; these run riot, while the artist is entirely awanting. The distortions of Fig. 13 may serve as an example.

The Gothic style forced its way also into classic Italy, but there it was never understood nor practiced in its true spirit. It was evidently from the beginning an imitation. The Italian architects tried to vie with those of the north in the size of their buildings, some of which, as San Petronio at Bologna, and Milan Cathedral, are enormous. The former illustrates the defects of Italian Gothic. The arches are very wide and there are few piers. There is therefore a bare and naked effect, not compensated for by any richness of sculpture or color. There is a want of *scale* about Italian Gothic buildings,

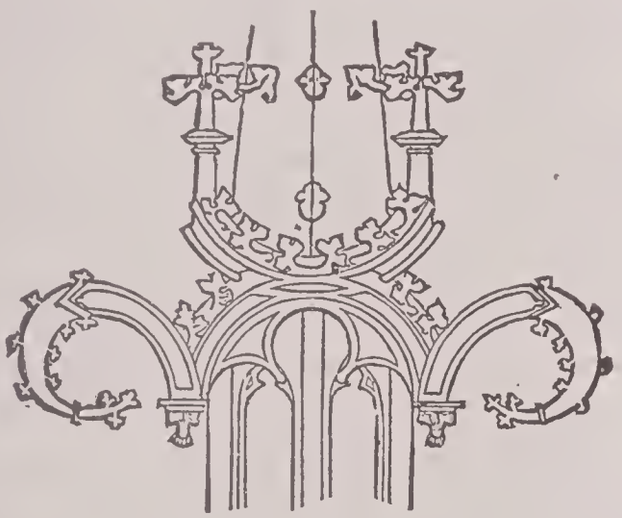


Fig. 13.

as there is about those of Italian classic architecture, both ancient and modern. Size alone is depended on for producing grandeur of effect. There is no attempt made to mark the size, and give a scale by which to judge of the dimensions of the buildings in those styles. A large classic temple is simply a small one magnified. In true Gothic architecture the case is different. Not only are the general dimensions magnified in a large edifice, but also the parts are multiplied. The columns and shafts remain of the same size, but their number is increased. The arches are enlarged in proportion to the general dimensions, but the caps, bases, and moldings remain of the same size as in a smaller building, and thus indicate the greater size of the arch. A true Gothic building of large dimensions thus tells its own greatness; but in a classic or Italian Gothic edifice the size has to be found out. Stained glass was little used in Italy. It may have been intended to decorate the walls with frescoes—as indeed is the case in a few instances. The church of St.

Francis, at Assisi, is the most remarkable building of this kind, and is a most interesting example of fresco-decoration.

The towns of Italy, being early enfranchised, have many municipal buildings in the Gothic style. For these, with those of Belgium, see MUNICIPAL ARCHITECTURE.

We might, in the same manner, trace the Gothic style in all the other countries of w. Europe; but its history is similar in all. It is in England and France that the true spirit of the style was most felt, and the finest examples remain. For the more important of the various styles of Gothic architecture in different countries, see EARLY ENGLISH; DECORATED; PERPENDICULAR; FLAMBOYANT.

In general both in France and England the style had a complete existence—it was born, arrived at maturity, and died. When the spirit of the early architects had pushed the design to its utmost limits, they rested from their labors, satisfied with their splendid achievements. Their successors occupied themselves with forms and details, and with the perfecting of every minute part. The art finally passed away, and left architecture in the hands of trade corporations—masons, carpenters, plumbers, etc.—who monopolized the whole work, and acted independently to the exclusion of one directing mind. The result was as we have seen: architecture became masonic skill, and Gothic architecture was finally superseded by the revival of classic architecture in the 16th century.

Bibliography.—Viollet-le-Duc, *Dictionnaire raisonné de l'Architecture Française* (1854-68); Bloxam, *Principles of Gothic Architecture* (1882); Rickman's attempt to discriminate the styles of Gothic Architecture (1817; 7th ed. 1881); Britton, *Antiquities of Great Britain* (1835); Pugin, *Examples of Gothic Architecture* (1835); Sharpe, *Architectural Parallels* (1848); Street, *Brick and Marble of Middle Ages* (1874); and *Gothic Architecture in Spain* (1869); Ruskin, *Stones of Venice* (1851-3); Fergusson, *History of Architecture* (1865-76); Charles H. Moore, *Development and Character of Gothic Architecture* (2d ed. 1889); Russell Sturgis, *European Architecture a Historical Study* (1896), Chapters V., VI., VII.; George Gilbert Scott, *Secular and Domestic Architecture* (1858), and *Rise and Development of Mediæval Architecture* (1879); Louis Gonse, *L'Art Gothique* (1890); Ed. Corroyer, *L'Architecture Gothique;* Carl F. A. von Lutzow, *Die Meisterwerke der Kirchenbaukunst* (1871); Charles L. Eastlake, *History of the Gothic Revival* (1872); Louis Courajod, *Leçons professées a l'Ecole du Louvre* (1887–96).

GOTHS [Lat. *Gothi, Gothones, Guttones, Gutæ,* etc.; Gr. *Gotthoi, Gottoi, Goutthoi, Guthōnes;* Gothic *Gutthiuda*]: powerful nation of antiquity, belonging to the Germanic race. By some writers they are thought to have had a Scandinavian origin, which was the belief of their own historian, Jornandes. Indeed, Jornandes, Procopius, Capitolinus, and Trebellius Pollio identified

them with the Getæ, a branch of the Thracian group of nations; but later researches, especially those of Dr. Latham, leave it almost without a doubt that the Goths were originally Germans. The earliest notice of them extant among the writers of antiquity is that of Pytheas of Marseille, who lived about the time of Alexander the Great (B.C. 356-323) and wrote a book of travels, some fragments of which have been preserved in the works of other writers. In one of these fragments, we find mention of a tribe of *Guttones* bordering on the Germans, and who lived round a gulf of the sea called Mentonomon, a day's sail from the island of Abalus, where they used to gather amber, and sell it to the neighboring Teutones. This gulf, there is every reason to believe, was the *Frisches Haff*, on the Prussian shore of the Baltic. The next notice that occurs of the Goths is in the *Germania* of Tacitus, in which they are called Gothones, and are represented as dwelling beyond the Lygii; in the same direction, that is, as the one pointed out by Pytheas, though not on the sea-coast. Tacitus also distinguishes them from the Gothini, a tribe e. of the Quadi and Marcomanni, and who are represented by him as using the Gallican tongue. The Gothones, according to this historian, were under regal government, and on that account not quite so free as the other tribes of Germany, yet with considerable liberty. The tribes next beyond them and dwelling immediately on the sea-coast, were the Rugii and Lemovii, whose form of government was also monarchical, and their weapons, like those of the Gothones, round shields and short swords.

We hear of the Goths next as settled on the coast of the Black Sea, about the mouths of the Danube, early in the 3d c. But at what time, or under what circumstances, their migration from the Baltic to the Euxine took place, it is impossible to ascertain. 'Either a pestilence or a famine,' says Gibbon, 'a victory or a defeat, an oracle of the gods or the eloquence of a daring leader, were sufficient to impel the Gothic arms on the milder climate of the south.' In their new home, which was also the country of the Getæ (whence, perhaps, the error that confounded them with that people), the Goths increased both in numbers and strength, so that, as early as the reign of Alexander Severus (A.D. 222–235), they made some formidable inroads upon the Roman province of Dacia. In the reign of Philip (244–249), they ravaged that province, and even advanced to the siege of Marcianopolis in *Mœsia Secunda*. The inhabitants ransomed their lives and property by a large sum of money, and the invaders withdrew for a time to their own country. In the reign of Decius they again entered Mœsia to the number of about 70,000, led by a king named Cniva. Decius himself advanced to meet them, and found them besieging Nicopolis. On his approach, they raised the siege, and marched away to Philippopolis, a city of Thrace, near the foot of

Mount Hamus. Decius pursued them by forced marches; but at a convenient opportunity the Goths turned with unexampled fury upon the Roman legions, and utterly defeated them. Philippopolis next fell before them by storm, after a long resistance, during which, and the massacre that followed, 100,000 of its inhabitants are reported to have been slain. This was in 250. In the following year another tremendous battle took place near an obscure town called Forum Trebonii, in Mœsia, in which the Romans were again defeated with great slaughter, Emperor Decius and his son being among the slain. The succeeding emperor, Gallus, purchased their retreat by an immediate present of a large sum of money, and the promise of an annual tribute for the future. The Goths now set themselves to the acquisition of a fleet, and with this, 253, advanced to the conquest of Pityus, a Greek town on the n.e. coast of the Black Sea, which they completely destroyed. In 258 they besieged and took Trebizond, when a great fleet of ships that were in the port fell into their hands. In these, they deposited the booty of the city, which was of immense value; chained the robust youth of the sea-coast to their oars; and returned in triumph to the kingdom of Bosporus. In the following year, with a still more powerful force of men and ships, they took Chalcedon, Nicomedia, Nice, Prusa, Apauræa, and Cius. In a third expedition, which numbered as many as 500 vessels, they took Cyzicus, then sailed down the Ægean, ravaged the coast of Attica, and in 262 anchored at the Piræus. Athens was now taken and plundered, and many other renowned places in Greece were either partially or wholly destroyed. Even Italy was threatened; but, says Gibbon, 'the approach of such imminent danger awakened the indolent Gallienus from his dream of pleasure.' The emperor appeared in arms; and his presence seems to have checked the ardor, and to have divided the strength of the enemy. A portion of the Goths now returned to their own country. But in 269 they again started on a maritime expedition in far greater numbers than ever. After ravaging the coasts of Europe and Asia, the main armament at length anchored before Thessalonica. In Claudius, successor of Gallineus, however, the Goths found a far abler general than any they had yet contended with. This emperor defeated their immense host, said to number as many as 320,000 men, in three successive battles, taking or sinking their fleet, and after an immense slaughter of their troops, pursuing such as escaped until they were hemmed in by the passes of Mount Hæmus, where they perished for the most part by famine. This, however, was only a single reverse. Aurelian, successor of Claudius, was obliged to cede to them, 272, the large province of Dacia, after which there was comparative peace between the combatants for about 50 years. In the reign of Constantine, their king, Araric, again pro-

voked hostility, but was obliged eventually to sue for peace with the master of the Roman empire. In the reign of Valens, they once more encountered the Roman legions, with whom they carried on a war for about three years (367–369) with some success. They now began to be distinguished by the appellations of Ostro-Goths and Visi-Goths, or the Goths of the east and west; the former inhabiting the shores of the Black Sea, and the latter, the Dacian province and the banks of the Danube. On the irruption of the Huns, the Visigoths sought the protection of Valens against those barbarians, and in 375 were allowed by him to pass into Mœsia, to the number of about 200,000. Great numbers of them also now took service in the Roman army; but a dispute soon arose between the Goths and their new allies, which led to a decisive battle, 378, near Adrianople, in which Emperor Valens lost his life. The Goths now threatened Constantinople, but were not able to take it; and during the reign of Theodosius, there was again comparative peace.

Henceforward, the history of the Visigoths and Ostrogoths flows in two divergent streams. Before tracing either of these, however, it should be noted that the Goths, for the most part, became converts to Christianity about the middle of the 4th c., adopting the Arian form of belief, in accordance with the instructions of their renowned teacher and apostle, Bishop Ulfilas. The term Mœso-Goths was applied to certain of the western Goths, who having settled in Mœsia, there devoted themselves to agricultural pursuit, under the protection of the Roman Emperors.

Visigoths.—Upon the death of Theodosius the Great, 395, and the partition of the empire between Honorius and Arcadius, the renowned Alaric, King of the Visigoths, sought the command of the armies of the eastern empire, and upon being refused, invaded Greece with an army of his countrymen. About 400, he invaded Italy, took and pillaged Rome (410), and was preparing to carry his arms into Sicily and Africa, when his career was arrested by death. See ALARIC. Alaric was succeeded in the sovereignty by Athaulf (reigned 410–415), who, having married Placidia, the sister of Honorius, withdrew from Italy into the south of Gaul, and about 412 crossed the Pyrenees into Spain. Athaulf was assassinated at Barcelona, and his successor, Sigeric, dying the same year, the choice of the Goths now fell on Wallia (415–418), who extended his power over a great part of southern Gaul and Spain, and made Toulouse his capital. The Goths, under this monarch, greatly assisted the Romans in their contests with the Vandals and the Alani. Wallia was succeeded by Theodoric I. (418–451), son of the great Alaric. He lost his life in the bloody engagement of Châlons-sur-Marne, leaving the throne to his son Thorismund (451–452), who, however, was assassinated by his brother Theodoric II.

(452–466), who reigned for some years, but was at length himself assassinated by his brother Euric (466–483), whose reign was unusually brilliant and successful. He extended the sovereignty of the Visigoths considerably both in France and Spain, introduced the arts of civilization among his subjects and compiled for their use a code of laws, in which were embodied many sound principles of jurisprudence. Under his successors, Alaric II. (483–506) and Amalaric (506–531), however. the kingdom of the Visigoths declined before that of the Franks. Alaric II. fell by the hand of Clovis in battle 507, and Amalaric was killed either in battle or by an assassin 531. Under his successor Theudes, the rule of the Visigoths was confined exclusively to Spain. Theudes was in his turn assassinated in his palace at Barcelona 548. It will not be necessary to trace the long line of Visigothic kings that subsequently ruled in Spain 548–711. The Visigothic power was completely broken, and their last king, Rodrigo or Roderick, slain by the Saracen invaders on the battle-field of Xeres de la Frontera.

Ostrogoths.—At the time when the Visigoths were admitted by Valens within the boundaries of the Roman empire, the same favor was solicited by the Ostrogoths, but was refused them by that emperor. They revenged themselves for this slight or injury by making frequent incursions into the Roman territories, sometimes on their own account, and sometimes as the allies of the Visigoths. In 386, the Ostrogoths sustained a severe defeat under their king or general, Alatheus, in attempting to cross the Danube, when many thousands of them perished, either by the sword of the Romans, or in the waves of the river. After this, they obtained a settlement in Phrygia and Lydia, but were ever ready to aid any fresh band of barbarians that prepared to assault the empire. Thus, they joined Attila in his renowned expedition against Gaul (450–453), and fell by thousands under the swords of their kinsmen the Visigoths at the battle of Châlons-sur-Marne. After this, they obtained a settlement in Pannonia, whence they pressed upon the eastern empire with such effect, that the sovereigns of Constantinople were glad to purchase their forbearance by large presents of money. In 475, Theodoric, greatest of the Ostrogoth sovereigns, succeeded to the throne upon the death of his father Theodemir. He directed his arms almost immediately against the eastern emperor Zeno; and having gained considerable advantages over him, obtained a grant of some of the richest provinces in the empire. Eventually, he was named chief of the imperial guard, and indeed consul for the year 484. In 488, with the consent and advice of Zeno, he planned an immense expedition against Odoacer, King of Italy, who had held that title since 476, when he dethroned Augustulus, last of the western emperors. Theodoric utterly defeated Odoacer, slew

him, it is said, with his own hand, and reigned undisturbed sovereign of Italy until his death 526. The seat of his empire was at Ravenna, which he sometimes exchanged for Verona, and once—in 500—he visited Rome, when he convened a meeting of the senate, and declared that it was his intention to rule the people committed to his charge with even-handed justice. To a great extent, he fulfilled this promise, and governed his subjects on the whole wisely and to their advantage. The glory of his reign was, however, sullied by the putting to death of two of the most distinguished men of that age, Boethius and Symmachus, upon the plea that they were engaged in a conspiracy against him. During his reign, the Ostrogoth kingdom included, besides Italy, all the adjoining countries within the Rhone and the Danube; also the modern Bosnia, Servia, Transylvania, and Wallachia. In the disorders consequent on the death of Theodoric, Emperor Justinian sought to win back Italy to the allegiance of the emperors of Constantinople; and for this purpose he despatched Belisarius at the head of an army into that country. In 536, Belisarius entered Rome, which he held for his master, though invited by the Goths to become himself their king; but all his and his successor's efforts to subdue the Goths were at that time utterly fruitless. Totila (541–552), a noble Goth was elected as successor to Vitiges, antagonist of Belisarius, but was conquered in the battle of Tagina, by the imperial general, Narses, 552. In that battle, Totila received his death-wound, and was succeeded by Teias, who did all that a brave man could to repair the misfortunes of his countrymen. It was to no effect, however, for he also was killed in battle in the following year, when 'his head,' says Gibbon, 'exalted on a spear, proclaimed to the nations that the Gothic kingdom was no more.' The Ostrogoths, broken and dispersed by their calamities, henceforward disappear from history as a distinct nation, their throne in Italy being filled by the exarchs of Ravenna; while the nation generally became absorbed in the indiscriminate mass of Alani, Huns, Vandals, Burgundians, and Franks, who had from time to time established themselves in the dominions of the old Roman empire.

GOTLAND, *gŏt'land* (*Götaland*, or *Götarike*): most southern of the three old provinces or main divisions of Sweden (q.v.). Gotland is now divided into 12 læns or departments; total area about 37,000 sq. m. or one-fifth of all Sweden; pop. more than 2,500,000. The greater part of the region especially in the north and interior, is covered with mountains, forests, and lakes; but its s. districts contain some of the most fertile land in Sweden. The principal lakes are the Wener (q.v.), and the Wetter (q.v.). The river Göta, which was unfit for navigation on account of its cataracts—the most picturesque of which is Trollhättan—has been rendered navigable by the construction of numerous

locks and canals, and is now open to vessels of considerable burden from Gottenborg, on the Cattegat, to Lake Wener, whence the Göta canal extends the line (of 260 m.) of internal communication across the kingdom to its e. shores. Gotland comprises a large portion of the mining districts, and is especially rich in iron and alum, and yields good copper, nickel, coal, etc. The peasantry are superstitious, attached to their old traditional usages and their national costume, but are honest and industrious, hospitable and contented.

GOTTENBORG, *gŏt'ĕn-borg*, or GOTHENBURG [Swed. *Göteborg*]: chief commercial town, and next to Stockholm, most important city of Sweden; lat. 57° 41′ n., long. 11° 58′ e.; principal town of the læn of Gottenborg. Gottenborg was founded by Gustavus Adolphus 1618, is on the river Göta, a few miles from the Cattegat, and consists of a lower and upper town; the former intersected by numerous canals, which are bordered by *allées* of fine trees, and spanned by numerous bridges; and the latter picturesquely scattered over the adjacent rocky heights. Its admirable harbor, protected by three forts, affords safe anchorage to ships of heavy burden, and has long been noted for extensive foreign commerce. The upper parts of the town have wide and regular streets and good stone houses; but there are few buildings deserving of special notice except the new church, the exchange, the cathedral, the town-hall, and arsenal. Gottenborg is the see of a bishop, and the seat of the gov. of the district. It has good schools, one of them founded by Oscar I. for the children of soldiers; a public library; an acad. of science and literature, incorporated 1775; etc. The Göta canal, which connects the German Ocean and the Baltic, brings Gottenborg into direct communication with Stockholm and a great portion of the interior of the kingdom, which it supplies with the products of foreign commerce and its own home-industry. The latter is of considerable importance, and includes, besides ship-building, extensive manufactories of woolen and cotton goods, sail-cloths, tobacco, snuff, glass, paper, sugar, and porter. About 2,000 vessels, of 500,000 tons, annually enter the port. The exports are iron, copper, deals, tar and pitch, alum, fish, etc.; and the imports, salt, cereals, wine, and articles of colonial trade. The great feature of the Gottenborg *Licensing System*, which has acquired some notoriety, is the elimination of private profit in the sale of spirits, by having the public-houses conducted by managers paid by salary, while the profits are paid into the town treasury. Pop. (1900) 130,619.

GOTTFRIED VON STRASBURG, *gŏt'frēt fon strâs'bûrg*, or GOD'FREY OF STRASBURG (Meister Gottfried of Strasburg), so called, it is believed, either from having been born or from having resided in Strasburg in Alsace: latter part of the 12th and beginning of the 13th c.; died between 1210–20: one of the most eminent poets

or minnesingers of the Middle High German period. His chief work, *Tristan*, in the composition of which he was employed at his death, and which extends to about 20,000 stanzas, was written about 1207, during the lifetime of Hartmann of Aue, whom he celebrates as the first of German narrators, and after the publication of the first portion of Wolfram von Eschenbach's *Parcival*, to the prologue to which he alludes. The morality of the poem, after the manner of that age, is not high; but in a merely literary view it is important in the history of European literature. Eilhart of Oberge had worked up the story of *Tristan* from a French poem. Gottfried founds his story on another French poem (of which considerable fragments are extant), and names as the author Thomas of Brittany, who however, is not to be confounded with the half or wholly fabulous Thomas of Ercildoune, referred to in the old English story of *Tristan*, published by Sir Walter Scott. Besides *Tristan*, some lyric poems by Gottfried are extant. Gottfried's works, with later continuations of *Tristan*, were published by Von der Hagen (1823). An admirable edition of Gottfried has been furnished by Bechstein (1869; 2d ed. 1873). Modern German translations have been given by Kurtz and Simrock. Wagner made use of *Tristan* for his opera *Tristan und Isolde*.

GOTTHELF, JEREMIAS. See BITZIUS, ALBERT.

GÖTTINGEN, *göt'tĭng-ėn:* town in the former kingdom of Hanover lat. 51° 31′ n., long. 9° 56′ e.; one of the pleasantest in lower Germany; in a fruitful valley on both banks of an artificial arm of the Leine, called the New Leine, about 60 m. s. of Hanover. It is in general well built, but is almost destitute of fine edifices, and has an air of solitude, which even the number of students cannot dissipate. The *Rathhaus*, an old castellated and picturesque edifice; the educational institutions, of which there are many; the hospital, and the university, are the only buildings of any note. The univ. was instituted by George II., King of England and Elector of Hanover, 1734, and opened 1737, Sep. 17. Connected with it are the library, containing more than 500,000 vols. and 5,000 manuscripts; the Royal Soc., founded 1750, which publishes the well-known transactions and the *Göttinger Gelehrte Anzeigen:* the observatory; the art museum, with collections of old oil-paintings, of engravings, of coins and models of all sorts, and some casts from the antique; the lying-in hospital, the pedagogical seminary, the gymnsium, the chemical laboratory; and the botanic gardens (laid out under Haller's superintendence 1739), one of the chief ornaments of the town. The number of students attending the univ. of Göttingen (1822–26) averaged 1,481 annually; but in consequence of the troubles of 1831, the number in 1834 had fallen to 860. The univ. could, however, still boast a rare assemblage of distinguished teachers, such as Blumenbach, Dahlmann,

Ewald, Gauss, Gervinus, Gieseler, Herbart, Lücke, Otfr. Müller, the brothers Grimm, etc.; but the expulsion in 1837 of the 'seven professors,' Albrecht, Dahlmann, Ewald, Gervinus, the two Grimms, and W. Weber, for political reasons, inflicted a blow from which it has never fully recovered. It has more than 130 professors of various grades; many are men celebrated throughout Europe. The number of students is about 1,400. The chief manufactures of the town are hosiery, leather, and musical and scientific instruments; but the only flourishing trade of Göttingen is in the sale of tobacco and tobacco-pipes, books, and sausages. Pop. 30,293.

GOTTSCHALK, *got'shâlk,* or FULGENTIUS, *fŭl-jĕn'shĭ-ŭs:* about 806–867, Oct. 30; b. Mentz, Germany: theologian. His father was a Saxon count, who placed him in the Benedictine monastery of Fulda at an early age. In 829 he wished to be released from his vows, and to return to the world, and after much trouble obtained the necessary dispensation from the synod; but through the hostility of the Abbot Raban (Rabanus Maurus) the dispensation was afterward cancelled, and he was transferred to the monastery of Orbais, in Soissins. While there he made a special study of the writings of Augustine, and became a believer in the doctrine of absolute predestination, to condemnation as well as to salvation. His teachings met with great opposition; Notting (Nothingus), Bishop of Verona, reported him to his former abbot, then become abp. of Mentz, who summoned him before the council of Mentz 848, where in the presence of the emperor he defended his views, but was pronounced guilty of heresy and turned over to his superior, Hincmar of Rheims, for punishment. In 849 he again defended himself in an assembly at Chiersy, for which he was again condemned, whipped severely in the presence of the emperor and bishop, and imprisoned for life in the monastery of Hautvilliers. The brutal hostility of Raban followed him to the last, prevented Hincmar answering the summons of the pope to account for the harsh treatment, and led the superior to deny Gottschalk the consolations of the church in his last hours, as well as burial in consecrated ground.

GOTT'SCHALK, LOUIS MOREAU: 1829, May 18—1869, Dec. 18; b. New Orleans: pianist and composer. He began taking lessons on the piano and violin when 6 years old, and when 12 was sent to Paris, where he studied the piano with Hallé and Stamaty, and harmony with Maleden, beside having the friendship of Hector Berlioz. He made his first appearance in public in Paris in 1845, continued his study in musical composition 3 years longer, and then gave his first series of public concerts in Paris. 1848–53 he made professional tours through France, Spain, and Switzerland and when he gave his first concert in the United States, Boston, 1853, Feb. 11, he had the prestige of a great European success. He gave concerts in the chief cities of

the United States, Mexico, S. America and Australia, playing principally his own compositions, and while performing his *La Mort*, in a musical festival he had projected at Rio de Janeiro, was stricken with a fatal sickness.

GOTTSCHED, *gŏt'shĕt*, JOHANN CHRISTOPH: 1700, Feb. 2—1766, Dec. 12; b. Judithenkirch, near Königsberg, Prussia: German writer. At the age of 14 he entered the Univ. of Königsberg to study for the ministry, but he soon turned his attention to philosophy, the fine arts, and languages. In 1724, he removed to Leipsic, where 1730 he became extraordinary prof. of philosophy and poetry, and 1734 prof. of logic and metaphysics. Gottsched endeavored to make the German language the vehicle of instruction for his countrymen in literature and science. In other respects, he was essentially French; and he valued elegance, precision, and purity of style. Gottsched executed a multitude of poems, critical and philosophical works, translations, etc. His tragedy, *Der Sterbende Cato* ('The Dying Cato'), formerly very popular, is now regarded merely as a specimen of 'correct' and watery verse. See BODMER.

GOUDA, *gow'dâ* (Dutch, *Ter Gouwe*): town of Holland, province of S. Holland, on the right bank of the Hollandsche Yssel, where it is joined by the Gouwe, 11 m. n.e. of Rotterdam. It has a large market-place, consisting of a spacious square, which contains the town-house and the church of St. John. The latter building has 31 magnificent stained glass windows, given by Philip II. of Spain, Margaret of Austria, William I. Prince of Orange, and other high persons. They were executed 1555–1603 by the brothers Crabeth and others, and are among the finest in Europe. Gouda is famed for its tobacco-pipes: the clay used is brought from Coblenz and Namür. It has also numerous potteries, extensive brick and tile works. The bricks are called clinkers, and are much used in building and in paving. Gouda also manufactures cotton, woolen, and sail-cloths, has rope-walks, gin-distilleries, breweries, and a famous cheese-market. There is a stearine-candle factory which employs several hundred men and women. Book-printing, making leather, and soap-boiling also are industries. Pop. (1901) 22,651.

GOUDIMEL, *gō-de-mĕl'* CLAUDE: 1510–72; b. Besançon, France: musical composer. There is evidence that beside a thorough musical education he received a good classical training. In 1540 he was at the head of a school of music in Rome where Palestrina and other famous musicians were pupils. From Rome he went to Paris, and there published a setting of Horace's *Odes* in conjunction with Jean Duchemin 1555, and a setting of the French version of the *Psalms* by Marot and Beza, written in 4 parts, with the melody assigned to the tenor,

1565. Some of the tunes were adopted by the German Lutherans, and many others are still used in French Protestant churches, and a few in the United States. He composed also a number of masses and motets. Goudimel fell a victim to the St. Bartholomew massacre at Lyons.

GOUGE, n. *gowj* [F. *gouge*—from mid. L. *gūvĭă*, a chisel: Sp. *gubia*, a hollow chisel]: a rounded hollow chisel for cutting channels or groves in wood or stone: V. to scoop out as with a gouge; to force out, as the eye, with the thumb or finger. GOUG'ING, imp.: N. the act of scooping out, as with a gouge. GOUGED, pp. *gowjd*.

GOUGH, *gŏf*, JOHN B.: American temperance lecturer: 1817, Aug. 22—1886, Feb. 17; b. Sandgate, Kent, England. His father was a pensioner of the Peninsular war; his mother, a village schoolmistress. At the age of 12, he went to America as an apprentice, and worked on a farm in Oneida county, N. Y. In 1831, he went to New York, where he found employment in the binding department of the Meth. book establishment; but habits of dissipation lost him this employment, and reduced him to that of giving recitations and singing comic songs at low grog-shops. He was married 1839; but his drunken habits reduced him to poverty and delirium tremens, and probably caused the death of his wife and child. A benevolent Quaker induced him to take the pledge; and he attended temperance meetings and related his experience with such effect as to influence many others. In 1842, he fell into a snare laid for him and had a single relapse into drunkenness; but an eloquent and evidently most sincere confession restored him to favor and he lectured in various parts of America with immense success. In 1853, he was engaged by the London Temperance League to lecture two years in the United Kingdom, where he drew vast crowds by his earnest, and by turns amusing and pathetic orations. An autobiography and a vol. of his addresses had a wide circulation. He was a devout Christian, of sincere purpose and unflagging zeal, giving his help freely to all efforts for public good. His residence was for many years near Worcester, Mass., where he was held in high regard by the whole community. He died at Philadelphia.

GOUJEER, n. *gō'jēr* [OF. *gouge*, a servant, a prostitute F. *goujat*, a blackguard]: in *OE.*, the venereal disease.

GOUJON, *gó-zhōng'*, JEAN: about 1515–72; b. Paris: sculptor and architect. He was employed on the church of St. Maclou at Rouen 1540, and on the cathedral there 1541; worked with Pierre Lescot, architect of the Louvre, on the restorations of St. Germain l'Auxerrois 1542–44 was employed with Bullant on the Chateau d'Ecouen; and on the accession of Henry II. entered the royal service. In the Louvre he executed the reliefs of the

Escalier Henri II., the carvings at the s.w. angle of the court, and the Tribune des Cariatides, and he was the author of what is considered the masterpiece of French sculpture, the *Diane Chasseresse* now in the Louvre collection. In 1561 he was suspected of Huguenot tendencies, and as from that year his name does not appear in the Louvre accounts, it is believed that he was among those in the royal employment whom the Rom. Catholics that year attempted to have dismissed. There is no direct evidence of his death, but it is believed to have occurred in the St. Bartholomew massacre.

GOU'KEKA, (or GOTCHA, or SEVANG), LAKE OF: deep inland lake of Russian Armenia, lat. 40° 8′—40° 35′ n., and long. 44° 45′—45° 35′ e.; 30 m. n.e. of Eriwan. It is 47 m. in length from n.w. to s.e., 15 m. in average breadth, and is in a mountainous district 5,300 ft. above sea-level. It is very deep, and yields good fish; its banks abound in volcanic products; and without having any considerable outlet, it receives the waters of several streams.

GOULARD'S EXTRACT, n. *gô-lârdz'-* [named after Thos. *Goulard*, a surgeon who discovered it]: in *pharm.*, a saturated solution of basic lead acetate, used as a lotion in cases of inflammation.

GOULD, *gôld*, AUGUSTUS ADDISON, M.D.: 1805, Apr. 23–1866, Sep. 15: b. New Ispwich, N. H.: naturalist. He graduated at Harvard College 1825, and its medical dept. 1830; spent some time as scientific instructor there; began practicing in Boston, and was appointed visiting-physician to the Mass. Gen. Hospital 1856. His scientific studies led him to the special fields of botany, zoology, and conchology; and in the latter he became one of the most eminent authorities in the world. He aided Sir Charles Lyell in his geological investigations in the United States; examined, classified, and reported on the shells collected by the Wilkes (1840) and the Ringgold and Rogers (1860) expeditions: was a founder of the Boston Soc. of Nat. Hist., pres. of the Mass. Med. Soc. 1864–6, fellow of the American Acad. of Arts and Sciences and of the American Philosophical Soc., and a founder of the National Acad. of Sciences. Besides a great number of reports, he published *A System of Natural History* (1833); *Mollusca and Shells* (1846); *The Mollusca of the North Pacific Expedition* (1860); and *Otia Conchologia* (1862).

GOULD, BENJAMIN APTHORP, PH.D., LL.D.: astronomer: b. Boston, 1824, Sep. 27; d. 1896, Nov. 26; son of BENJAMIN APTHORP GOULD (1787–1859), who was principal of the Boston Public Latin School. Gould received the Franklin gold medal at the Latin School, graduated at Harvard College 1844, was master of the Roxbury Latin School one year, and spent 3 years studying astronomy in the Greenwich, Paris, Berlin, Göttingen and Altona observatories. On his return to the

United States he established at Cambridge *The Astronomical Journal*, and conducted it chiefly at his own expense 1848–61. He was in charge of the longitudinal operations of the U. S. Coast Survey 1851–67; made the first determination of transatlantic longitude by telegraph cable at Valentia, Ireland, 1866; was director of the Dudley Observatory at Albany, superintended its construction, planned its principal instruments, and set up the first clock that gave the time telegraphically to distant dials 1856–59, and was given charge of the statistics of the U. S. Sanitary Commission, with which he organized a system of valuable anthropological measurements 1863. In 1868 he was appointed by the govt. of the Argentine Republic, S. A., to organize and direct a national observatory at Cordova, where he remained till 1885. During this period he completed a set of maps of the stars visible to the naked eye from the observatory, took observations on more than 83,000 of them, made various telegraphic determinations of longitude, and established a national meteorological bureau. He returned to Cambridge 1885, and re-established *The Astronomical Journal.*

GOULD, Elgin Ralston Lovell, American economist: b. Oshawa, Ontario, Canada, 1860, Aug. 15. He was graduated from Victoria University, was fellow (1882–4) and lecturer (1892–7) at the Johns Hopkins University, and professor in the University of Chicago (1895–6). In 1896 he became president of the City and Suburban Homes Company of New York, and at one time vice-president of the American Economic Association. He has written: *The Housing of Working People; Popular Control of the Liquor Traffic; The Gothenburg System of Liquor Traffic; The Social Condition of Labor.*

GOULD, George Jay, American capitalist: b. New York 1864, Feb. 6. He was the eldest son of Jay Gould (q.v.). In financial circles he was active chiefly in connection with his large railway interests, particularly as president, from 1888, of the Little Rock & Fort Smith Railroad, from 1892 of the Manhattan Elevated Railroad of New York, and from 1893 of the Saint Louis, Iron Mountain & Southern; the International & Great Northern; the Missouri Pacific; etc.

GOULD, Hannah Flagg, American poet: b. Lancaster, Mass., 1789: d. Newburyport, Mass., 1865, Sep. 5. She was an aunt of B. A. Gould (q.v.), and at one time very popular as a verse writer. She published: *Hymns and Poems for Children* (1854); *The Golden Vase; The Youth's Coronal* (1850); *The Mother's Dream* (1853); etc. *The Snow-Flake* and *The Frost* are still remembered and quoted among her poems.

GOULD, Helen Miller: an American philanthropist: b. 1868, June 20; daughter of the late Jay Gould. Her name became widely known through her numerous gifts

to educational and charitable enterprises. At the beginning of the American-Spanish war she gave $100,000 to the government, and became actively engaged in the Woman's National War Relief Association, toward the work of which she gave freely. When the sick soldiers were taken to Camp Wikoff, L. I., she gave $25,000 for needed supplies. Among her many other gifts were $380,000 to the University of New York, 1898; $50,000 to the Young Men's Christian Association of Brooklyn for a naval branch; and $100,000 to the University of N. Y., 1900, or a Hall of Fame for Great Americans.

GOULD, JAMES, LL.D.: 1770, Dec. 5—1838, May 11; b. Branford, Conn.: lawyer. He graduated at Yale College 1791, was tutor there 1793–95, studied law in the Litchfield (Conn.) Law School (see LITCHFIELD); was admitted to the bar, was professor and superintendent of the Litchfield Law School 1798–1833, and judge of the Conn. supreme court 1816–19. He published *Principles of Pleading in Civil Actions* (New York 1832).

GOULD, JAY: financier: b. Roxbury, Deleware co., N. Y., 1836, May 27; d. 1892, Dec. 2. He was brought up on his father's farm, attended Hobart College a short time, acquired a taste for mathematics and surveying; made surveys of Ulster, Albany, and Delaware counties, and began his railroad career directly after the panic of 1857. He invested all his money in bonds of the Rutland and Washington railroad, and became pres., treas., and supt. of the road. Soon afterward he effected a consolidation of his road with the Rensselaer and Saratoga road, withdrew his capital, removed to New York, opened a broker's office, and began dealing in Erie railroad stocks and bonds. In association with James Fisk, Jr. (q.v.), he entered the directory of the company, and was selected pres. with Fisk as vice-pres. and treas. On the reorganization of the company 1872 he lost official connection with it. A long litigation ensued between the English bondholders and the company, which resulted in his being compelled to relinquish several millions in stocks and bonds. He then invested heavily in the various Pacific railroads, secured control of a number of important lines, built branches, and effected combinations which resulted in the establishment of what is known as the 'Gould System.' For many years he remained the largest holder of Western Union Telegraph and New York Elevated Railroad stocks, and was (1889) pres. of the Manhattan Elevated Railroad Company, which virtually owns the other elevated roads. He was a man of great activity and shrewdness, and evoked criticism for some of his financial transactions.

GOULD, JOHN, English naturalist: b. Lyme, Dorsetshire, 1804, Sep. 14; d. London, 1881, Feb. 3. His reputation as a taxidermist procured him the post of curator to the Museum of the Royal Zoological Society in 1827, and in 1832 he published *A Century of Birds from the Himalayan Mountains.* He next undertook a

work of much more extensive character, entitled the *Birds of Europe*, published 1832–7. This was followed by: *Birds of Australia* 1842–8; *Mammals of Australia* (1859); *Monograph of the Trochilidæ, or Family of Humming Birds* (1850); *Monograph of the Odontophorinæ, or Partridges of America;* etc.

GOULD, Thomas R.: 1818–1881, Nov. 26; b. Boston: sculptor. He was engaged in the dry-goods business till 1850, then studied modeling with Seth Cheney in Boston, had a studio there till 1868, when he removed to Florence, Italy. He made a brief visit to Boston 1878, and died in Florence. He made busts of Emerson, Gov. Andrew, Seth Cheney, William Monroe, and the elder Booth, portrait statues of John Hancock and Gov. Andrew, medallions of *Christ* and *Satan*, and statues of *The West Wind*, *Cleopatra*, *Timon of Athens*, and *Ariel*.

GOULE, n. *gôl:* the same as Ghoul.

GOULE, n. *gôl* [OF. *goule;* F. *gueule;* L. *gula*]: the throat.

GOUNOD, Charles François, shärl fräñ-swä gô-nō French composer: b. Paris 1818, June 17; d. St. Cloud 1893, Oct. 18. He began his studies in the Paris Conservatory under Halévy, Le Sueur, and Paer, and carried the Rome prize with his cantata *Fernando* in 1849. While in Rome he made Italian Church music his chief study. His mass in the style of Palestrina, which he composed in Vienna in 1843 after his return from Rome, was the first fruits of this study. On arriving at Paris he took charge of the music in the church of the Missions Etrangères, and produced no original work until April, 1851, when his first opera, *Sappho* appeared. Gounod's next production was the five-act opera, *The Bleeding Nun* (*La Nonne sanglante*) (1854). Following this was the comic opera founded on Molière's *Le Médecin malgré lui* (1858), and the grand opera *Faust et Marguerite*, which latter was a success and was produced with much enthusiasm in all the more important opera houses of Europe. Even in Germany, the home of the Faust legend in music and poetry, the originality, and wealth of melody of Gounod's music, together with his powerful orchestration were so manifest above all else in the opera, that his Faust became a favorite with the public. Later operas of his were: *Philémon et Baucis* (1860), which was not popular; *La Reine de Saba* (1862); *Mireille* (1864); *Roméo et Juliette* (1867), which was favorably received in every opera house of Germany; *Polyeucte* (after Corneille's drama), which was a failure; finally the comic opera, *Cinq Mars* (1877), and the last of his grand operas, *Le Tribut of Zamora*, which was well received. Besides these operatic compositions he wrote much religious music, notably the *Rédemption*, which was performed in England and later in Germany, and has been very popular in the United States. He also produced at Brussels his *Mors et Vita*,

and in addition wrote cantatas, symphonies, pieces for the piano and numerous songs. During the Franco-Prussian war (1870–1) he resided in England, where he formed the Gounod Choir, a chorus of mixed voices, whose concerts were widely popular. Consult: Claretie, *Portraits Contemporains* (1875); Voss, *Ein Lebensbild* (1895); Paguerre, *Charles Gounod, sa vie et ses œuvres* (1890); Boret, *Charles Gounod, His Life and His Works* (1890).

GOUR. See GAUR.

GOURA, *gô'ra* (*Lophyrus coronatus* or *Columba coronata*): by far the largest of the pigeon family (*Columbidæ*); native of Java, New Guinea, and other islands of the Indian archipelago. It is two ft. four inches in length from the tip of the bill to the extremity of the tail. It is a very beautiful bird, of a grayish-blue color, parts of the back and wings black and purplish-brown, a broad white bar across the wings. The head is adorned with a large semicircular crest of narrow straight silky feathers, always carried erect. The Goura is in the highest esteem for the table, and might probably be domesticated with great advantage in tropical countries; but attempts to introduce it into the poultry yards of Holland have completely failed, owing to the climate.

GOURD, n. *gōrd* or *gôrd* [F. *gourde*—from OF. *gouhourde*—from L. *eŭcur'bĭtă*]: plant which produces a large fruit somewhat of a bottle shape, native of warm climates; also its fruit; a vessel for liquids, made from the hard outer shell of the *Lagenārĭă vulgārĭs*. GOURDY, a. *gōr'dĭ*, swelled in the legs. GOUR'DINESS, n. swelling on a horse's leg.

GOURD, *gōrd* (*Cucurbita*): genus of plants of nat. ord, *Cucurbitaceæ*, nearly allied to the cucumber; having male and female flowers on the same plant, the flowers large and yellow. The species are annual plants of very rapid growth; their leaves and stems rough; their leaves broad and lobed; their stems often very long and trailing; native of warm climates, though the native region of the kinds chiefly cultivated is very uncertain, and they have probably been greatly modified by long cultivation, so that perhaps all of them may be forms of one original species, native of some warmer parts of Asia. The COMMON GOURD or PUMPKIN (*C. pepo*), with smooth globose or pear-shaped fruit, varying from the size of a large apple to 50 or 70 lbs. in weight, is much cultivated in gardens and fields in almost all parts of the world where the climate is warm enough for it; and the fruit is not only a very important article of human food, but is used also with the super-abundant shoots for feeding cattle. In many countries pumpkins are a principal part of the ordinary food of the poorer classes, and are much used even by the wealthy; they are eaten not raw, but dressed in a great variety of ways—as in pies, with apples, sugar, spice, etc., or

sliced and fried with oil or butter, or made into soups, etc. Pumpkins are much cultivated in N. America. In England, they are not largely used, and never as food for cattle. The VEGETABLE MARROW (*C. ovifera* or *C. succada*) appears to be a mere variety of the pumpkin. It was introduced into Europe from Persia since the beginning of the 19th c., but is now more generally cultivated in Britain than any other kind of gourd, being one of the most hardy, and its fruit of excellent quality and useful for culinary purposes at almost every stage of its growth. When full grown the fruit is elliptic, very smooth, generally about nine inches long and four inches in diameter; but these dimensions are occasionally much exceeded. One of the most valuable gourds for culinary purposes is the GREAT GOURD (*C. maxima*); of which the Spanish gourd is a green-fruited variety; and the Great Yellow gourd, the largest of all, has yellow fruit, with firm flesh of a deep yellow color. It is sometimes fully 200 lbs. in weight, and eight ft. in circumference. The form of the fruit is a somewhat flattened globe; when boiled, it is pleasant and wholesome food. It is much cultivated in s. Europe. The SQUASH (*C. melopepo*) differs from all these in generally forming a bush, instead of sending out long trailing shoots; also in the extremely flattened fruit, the outline of which is generally irregular, and its whole form often so like some kinds of cap, that in Germany one variety is commonly known as the *Elector's Hat*, and the name *Turk's Cap* is bestowed on another. The squash is regarded as one of the best gourds, and is much cultivated in some parts of Europe and in N. America. The WARTED GOURD (*C. verrucosa*), which has a very hard-skinned fruit covered with large warts, and the MUSK GOURD (*C. moschata*), distinguished by its musky smell, are less hardy than the kinds above named; as is also the ORANGE GOURD (*C. aurantia*), sometimes cultivated for its beautiful orange-like fruit, which, however, though sometimes edible and wholesome, is frequently very unfit for use, on account of colocynth developed in it. This is apt to be the case in some degree with other gourds also, but the bitter taste at once reveals the danger. The same remark is applicable to the young shoots and leaves, which, when perfectly free from bitterness, are an excellent substitute for spinach. It has been suggested that railway-banks might be made productive of a great quantity of human food by planting them with gourds. Ripe gourds may be kept for a long time in a cool, well-ventilated place, and they are not injured by cutting off portions for use as required. The name gourd is often extended to many other *Cucurbitaceæ*. See SQUASH.

GOUT, n. *gowt* [L. *gutta*, a drop]: in *OE.*, a drop; a clot.

GOÛT, n. *gô* [F. *goût*—from OF. *goust;* It. *gusto*—from L. *gustus*, taste]: taste; relish.

GOUT.

GOUT, n. *gowt* [F. *goutte*, a drop, the gout—from L. *gutta*, a drop, so called from the old medical theory which attributed all disorders to the settling of a drop of morbid humor upon the part affected: Dut. *goete*, the palsy]: painful disease of the joints or extremities, to which high livers are most liable; it is often hereditary. GOUT'Y, a. *-ĭ*, subject to the gout or affected with it. GOUT'ILY, ad. *-ĭ-lĭ*. GOUT'INESS, n. *-nĕs*, state of being affected with the gout.

GOUT is a mediæval term of uncertain date, denoting a specific constitutional disorder, which occurs most frequently in persons habituated to luxury and past middle life. The acute attack begins usually by a painful swelling of the ball of the great toe or of the instep, sometimes of the ankle or knee; rarely, it attacks both lower limbs at once; more rarely, it seizes first on some other part of the body, the foot being either not attacked at all, or becoming involved at a latter period. In the great majority of cases, the foot is not only the first part attacked, but the principal seat of the disease throughout. Sometimes the disease smolders in the system in the form of disorders of the digestive or nervous functions, or of the circulation for considerable time before it takes the form of 'regular' gout—that is of an acute attack, or fit, of gout in the foot. The name podagra [Gr. *pod*, foot, and *agra*, seizure] indicates the leading character of the disease as apprehended by all antiquity; and the very numerous references to the disorder so called, not only in the medical writings of Hippocrates, Galen, Aretæus, Cælius Aurelianus, and the later Greek physicians, but in such purely literary works as those of Lucian, Seneca, Ovid, and Pliny, show the frequency and notoriety of the disease. The allusions show that the essential characters of gout have not been changed by the lapse of centuries; it is caricatured by Lucian in his burlesque of *Tragopodagra* in language quite applicable to the disease as now observed; while the connection of it with the advance of luxury in Rome is recognized by Seneca (*Epist.* 95) in the remark that in his day even the women had become gouty, thus setting at naught the authority of physicians, who had asserted the little liability of women to gout. Pliny likewise (book 26, chap. 10) remarks on the increase of gout in his own time; he is of opinion, further, that the disease must have been imported; for if it had been native in Italy, it surely would have had a Latin name. Ovid and Lucian represent gout as mostly incurable by medicine; from this view Pliny dissents. The list of quack remedies given by Lucian is one of the most curious relics of antiquity.

In the present day, gout is observed to prevail wherever there is an upper class having abundant means of self-indulgence, and living without regard to the primeval law of humanity 'in the sweat of thy face shalt thou eat bread'. The directness, however, with which

gout can be traced in particular cases, to its predisposing causes is very various; and in many instances, a well-marked hereditary tendency to the disease may be observed, which even a very active and temperate life can scarcely overcome; while, on the other hand, the most gross forms of excess may be practiced for a whole lifetime without incurring the gouty penalty. It is difficult to explain these variations; but they leave unaffected the general principle, that gout is a disease especially of those who have little physical exertion, and give great scope to the bodily appetites. Nevertheless, many of the worst sufferers from gout are pale and thin, and the disease is not uncommon in laborers and persons exposed to hardships, including scanty and unnutritious diet—'poorman's gout,' it is then called. The disease also occurs in cases of chronic poisoning, especially lead poisoning.

Sydenham in his treatise on gout nearly 200 years ago, truthfully described the paroxysm of regular gout: the following is an abbreviation. After some weeks of indigestion, with flatulent swelling and a feeling of weight, the patient goes to bed free from pain, and having had more than the natural appetite. In the night he is awakened by a pain in the great toe, or sometimes in the heel, the ankle, or the calf of the leg. The pain resembles that of a dislocated bone, and is accompanied by a sense as if water, not perfectly cold were poured over the affected limb; to this succeeds chilliness, with shivering, and a trace of feverishness, which diminish as the pain increases. From hour to hour, through this night and the following day until the next evening, the patient suffers a variety of torture in every separate joint of the affected limb; the pain being tearing, crushing or gnawing; the tenderness such that the weight of the bedclothes, or the shaking of the room from a person's walking, seems unbearable. The next night is one of tossing and turning, the uneasy limb being constantly moved to find a better position; till toward morning the victim feels sudden relief, and falls into a sleep, from which he wakes refreshed, to find the limb swollen; the venous distention usually present in the early stage having been succeeded by a more general form of swelling, often with itching between the toes and a peeling off of the cuticle. This individual attack may be repeated many times in the course of 'a fit of gout,' which commonly extends over a period of weeks, or even months, before the patient is completely relieved; or the attacks may occur in both limbs, or in several other parts of the body in succession, the real termination of the 'fit' being at last indicated by an apparent restoration of health, and even, in some cases, by a period of improved condition and capacity for exertion, as compared with the state of the patient before the attack.

The 'regular gout' in this form might almost be called a local disease; though during an attack there is more

or less fever, which seldom runs high; the appetite is lost, the tongue is coated, and the bowels are constipated. Regular gout forms only part of a nosological picture, in which the so-called irregular, atonic, metastatic, or retrocedent forms have to be included before it can be said to be complete. These, indeed, are the darker shadows of the picture; for regular gout, though a very painful disorder, is scarcely dangerous. The danger lies in the tendency of gout, when recurring often, to pass into irregular forms. One source of local aggravation, soon apparent, leads rapidly to other evils. The joints, repeatedly the seat of the regular paroxysm, become more or less permanently crippled and distorted. A white, friable, chalk-like material is gradually deposited around the cartilages and ligaments, and sometimes in the cellular tissues and under the skin. Sometimes this material is discharged externally by ulceration, and then usually with relief. At other times, it accumulates into irregular masses, or 'nodosities,' which entirely destroy, or at least greatly impair, the movement of the limb. The patient is laid up in his arm-chair; and exercise, the great natural remedy of the gouty, is denied by the conditions of the disease.

Then follow aggravations of all the constitutional sufferings; more marked, perhaps, in proportion as the local attacks in the foot become less so. Indigestion continues or becomes constant, assuming the form chiefly of acidity after meals; the liver becomes enlarged, the abdomen corpulent, the bowels disposed to costiveness: the kidney discharges an albuminous urine, sometimes containing tube-casts, and frequently there is tendency to gravel and calculus (q.v.); the heart is affected with palpitations, or fainting-fits occur, sometimes with spasmodic attacks of pain; the arteries become the seat of calcareous deposits, and the veins are varicose in the limbs and in the neighborhood of the lower bowel (see PILES); the temper is singularly irritable, and often morose; then, sooner or later, the appetite fails, the body emaciates, all the functions become enfeebled, and the patient falls a prey to diarrhea, or to some incidental disease. Sometimes the end is sudden, as by apoplexy or failure of the heart; sometimes, on the other hand, it occurs in one of those violent spasms which have popularly acquired the name of 'gout in the stomach,' the true character of which is not understood.

The nature of gout has long been a subject of dispute among pathologists and medical practitioners; and even to-day most physicians content themselves with saying that gouty manifestations depend upon the existence of a diathesis or habit of body—in this case the so-called uric-acid diathesis. The concretions found in the joints in all cases of well-marked and highly developed gout have a nearly uniform composition, into which the urate of soda (see URIC ACID) enters in considerable proportion. Uric acid is one of the constant organic elements

of the urine, through it is expelled from the system. In certain circumstances, uric acid is deposited also in the form of urinary gravel or calculus (q.v.); and it is this particular kind of gravel to which the gouty are especially subject. Uric acid in excess has been shown by Garrod to be present in the blood of the gouty. Notwithstanding these facts, however, it is by no means certain that uric acid has more than an incidental relation to gout, both conditions, uricacidemia (as it is uncouthly called) and gout, being dependent upon a common cause.

The cure of gout demands the careful consideration of all its predisposing causes in the individual, and the strict regulation of the whole life and habits accordingly, from the earliest possible period. It is the difficulty of this which makes gout proverbially intractable; for the regular attacks of the disease seldom occur until late in life, long after the habits have been fully formed that are most adverse to the cure. Rigid temperance in eating and drinking, with daily exercise proportionate to the strength and condition of the individual, in reality constitute the only radical cure. But the lesson is not learned, or learned too late. It should never be forgotten that a man of gouty family, or individually much exposed to the causes of the disease, can only hope to escape it in his old age by habits of life formed at an early period, and there is ample evidence that the disease may be warded off by careful avoidance of most of the common dissipations of youth, and it is not less certain that there is no other way of immunity. The well-known virtues of colchicum in treatment during the gouty fit are perhaps somewhat overrated by the public: and its dangers are not less striking than its virtues. It is certain, however, that in cautious medical hands colchicum is a remedy of great value in the gouty paroxysm; and also of value are certain natural mineral waters, e.g., Vichy and Carlsbad. The salicylates have been used with advantage. Alkalies and their salts have been much recommended for the removal of gouty deposits. A strict regulation of the diet, both during the attacks and in the intervals is of the greatest importance.

GOVERN, v. *gûv'ėrn* [F. *gouverner;* OF. *governer;* It. *governare*—from L. *gŭbernārĕ*, to direct, to govern: Gr. *kubernân*, to handle the rudder, to steer]: to direct and control; to regulate by authority; to command; to have influence or force, as a verb in grammar; to exercise authority; to restrain. GOV'ERNING, imp.: ADJ. holding the superiority; controlling; directing. GOV'ERNED, pp. *-ėrnd.* GOV'ERNOR, n. *-ĕr-nėr*, one who rules or directs; one who is invested with supreme authority; a ruler, a tutor: in a *machine*, a contrivance to control the speed, usually by an application of centrifugal force with automatic action, maintaining a uniform velocity with varying resistance; a regulator (see STEAM ENGINE). GOV'ERNORSHIP, n. the office of a governor.

GOV'ERNESS, n. *-nĕs,* a woman intrusted with the care and instruction of children or young ladies. GOV'ERNABLE, a. *-nă-bl,* manageable; obedient. GOV'ERNANCE, n. *-năns,* rule; management; control. GOVERNMENT, n. *gŭv'ėrn-mĕnt,* control; restraint; the exercise of authority; the ruling power in a state; the principle or system under which a state is ruled (see below): ADJ. connected with or pursued by government. GOV'ERNMEN'TAL, a. *-ėrn-mĕn'tăl,* of or relating to government. GOV'ERNANTE, n. *-ėr-nănt* [F.]: a woman who has the care of young girls of quality, as tutor or governess.—SYN. of 'govern': to rule; regulate; direct; control; manage; administer.

GOV'ERNMENT, in Political Signification: the power by which communities are ruled and the means by which, and the form and manner in which, this power is exercised.

Governments de facto and de jure.—Since they act only as the agents of the sovereign political power, governmental agents in order legally to exercise the functions of their offices, are obliged to possess a delegation of powers from the state they represent. In case they are not able to produce a sufficient evidence of this authorization, their acts are *ultra vires,* and as such of no legal force, and they themselves are subject to civil or criminal suit at the instance of the injured parties.

It not infrequently happens, however, that persons claiming political authority, while able to produce satisfactory evidence of their official status and competence, do so by referring to grants of power from a political sovereignty, the legitimacy of which is not admitted by the parties over whom their authority is attempted to be exercised. It thus becomes necessary to distinguish between governments *de facto* (*sed non de jure*) and governments *de jure.*

The terms *de facto* and *de jure* are applicable to governments in a purely relative sense. That is to say, which of the two is properly descriptive of a given political organization depends upon the point of view of those who characterize it. Thus a government is *de jure* as well as *de facto* when it has been established by, claims to represent, and is in fact guided by the will of a state the legitimacy of which is recognized by the individuals over whom its control is extended. It is *de facto* but not *de jure* to any particular individual when, though actually in existence and able to exercise a certain amount of power, its legal character is denied by that individual. Thus in the case of an attempted revolution; from the standpoint of those who have repudiated their allegiance to the old state, refused obedience to its government, and have organized for themselves a new political machinery, the old government has but an actual and not legal existence, the new government being the only one in their eyes possessing a legal basis. Upon

the other hand, from the point of view of those who still support the old state, the newly established government has but a *de facto* existence, the old government being conceived as the one legal organization.

The Ethical Right of Governments to Exist.—The concrete question as to the moral right of a particular government to exist and to coerce individuals, is often confused with the abstract one as to the moral justification for the existence of political restraint in general. These two questions are, however, quite distinct, and are to be answered upon quite different principles. So long as men's interests conflict, or, at least, so long as they are conceived by them to conflict, coercion of some sort must result, for the desires of all, under such circumstance, cannot be satisfied. Some will have to give way to others, or all yield in part. The force bringing about the final settlement may be individual, social, political, or religious, but in any case restraint is applied and the freedom of action of individuals concerned correspondingly interfered with. This being so, it is clear that the question as to the ethical legitimacy of coercion by the state is not to be answered by viewing such coercion as a restraint upon individuals who otherwise would possess entire freedom of action. Rather it is to be viewed as a control of individuals who, but for the existence of political government and law, would be subject to the compulsion of other forces. The only questions, therefore, that rightfully may be raised are as to the form that the compulsion shall assume, and the general principles that shall guide it. The justification, then, for the existence of any particular political authority, if justification there be, consists in the fact that it furnishes a more intelligent, more beneficial, more just, and less painful form of restraint than that which, in its absence, any other force or forces would supply. A state and its government is but an instrument humanly devised for a people's good. It therefore, has to be justified by its works. There is, thus, no theoretical difficulty in conceiving of a political authority so corruptly and oppressively administered as to cause evils overbalancing those that it prevents. In such a case, it has no ethical right to be. Practically speaking, however, there can be no question but that so grievous are the inevitable evils of lawlessness and anarchy that it is difficult to picture to oneself a political régime so evil in its effects as to render preferable to it a complete absence of political order.

Government by Choice.—The question as to how far forms of government are a matter of choice on the part of a free people, or are dictated to them by influences beyond their volition, has been discussed in a very interesting manner by John Stuart Mill in his important work on *Representative Government*. The conclusion at which he arrives concerning governmental forms is, that 'men did not wake on a summer morning and find

them sprung up; neither do they resemble trees,' which, once planted, 'are aye growing' while men 'are sleeping;' but that 'in every stage of their existence they are made what they are by human voluntary agency' (p. 4). This absolute power of human choice, however, is limited by three conditions which Mill states thus: 'The people for whom the government is intended must be willing to accept it, or at least not so unwilling as to oppose an insurmountable obstacle to its establishment; they must be willing and able to do what is necessary to keep it standing; and they must be willing and able to do what it requires of them to enable it to fulfil its purposes. . . . The failure of any of these conditions renders a form of government, whatever favorable promise it may otherwise hold out, unsuitable to the particular case' (p. 5). But there are still more important conditions, not here enumerated by Mill, but one of which at least is fully recognized in the sequel of his work, which, if not complied with, render forms of government unsuitable not only to one case, or stage of social development, but to all cases and all stages of development. These conditions may be broadly stated as under a single category—viz., that forms of government must conform to the constitution of human nature, and recognize those arrangements of Providence which are beyond the reach of human control. This condition seems so obvious, that one would suppose it could scarcely be overlooked in fixing on a peculiar form of government, yet there is none which has been overlooked more frequently. Government is an organization for practical ends; it cannot be authenticated by a mere aphorism, or based on a speculative theory, such as 'All men are socially equal,' or 'Only the wisest man or men can have the right to rule.' Pure monarchy, pure aristocracy, pure democracy, are theories; and an attempt at government based on any one of these to the exclusion of the others, is based on an assumption contrary to nature, and can be made to work only by the direct results of its action being counteracted by some indirect means. The state in all such cases is governed not in accordance with, but in spite of the form of government.

The Object of Government.—The famous discussion as to what is absolutely and in itself the best form of government which has occupied so large a share of human time and ingenuity, is one which may be dismissed with the observation, that it rests on another question not less keenly and perhaps scarcely less futilely discussed. The basal question is, What is the end of government? for it is clear that could the end-in-itself (the *telos-teleion*) be discovered, we might limit the discussion as to the best form of government to an inquiry into the means leading most directly to the attainment of this end. Now there are, and have always been, two classes of speculators, who assign what appear to be different, and what by many are believed to be irrecon-

cilable ends or objects to government and indeed to human effort, separate as well as aggregate. By the one, the end of government is said to be the greatest happiness of the greatest number,' or the greatest amount of human happiness absolutely considered; by the other class, it is said to be the realization of the idea of humanity—that is to say, of the divine and therefore primal conception of human nature, through the instrumentality of society. The manner in which the first or Utilitarian creed has been expounded by its most important adherents has tended to show that the two ends are in reality coincident. If happiness be so defined as to render it identical with moral, intellectual, and physical perfection, the advocate of the ideal end acknowledges that its attainment would involve, of necessity, the realization of its own aspirations. No lower or narrower definition of 'happiness as an end' can show itself as answering the demand which is sure to arise from man's nature for conformity or attempt at conformity to the highest conception of manhood. Government, for practical reasons of the time present, may call a halt on the upward path while it waits for a slow public enlightenment, and may still control its subjects; but if it finally and openly discard all aim at the complete ideals, it therein signs its own abdication of sovereignty over men.

A difference of opinion as to the objects of government scarcely more real, though attended with far more fatal consequences, than that which has divided speculative politicians, has ranged those who have dealt with government as a practical art in two opposite schools. By one school its object is said to be order; by the other, liberty; and each of these objects has been supposed to be attainable only to an extent proportioned to that to which the other was sacrificed. A truer insight into the laws of society has led a more enlightened school than either entirely to reverse this latter opinion; and—while holding the two objects referred to, to be in truth the proximate objects of all government—to perceive that they are not only reconcilable, but that each is attainable only in and through the other, and that the perfection with which either is realized in any particular instance will be, not in inverse but in direct proportion to that to which the other is realized. Order, so far from being the opposite of liberty, is thus the principle by which the inevitable conflicting claims to liberty are reconciled. The principle really opposed to liberty is license, in virtue of which it is endeavored to carry the sphere of the liberty of one individual into that of another. To the extent to which this takes place, the liberty of both is sacrificed, for the territory in dispute is free to neither of the claimants; whereas order, by preserving the boundary between them, assigns to each the portion which is his due, and prevents the waste of liberty which is necessarily involved in the

gratification of license, and the consequent existence of anarchy.

Government with the Consent of the Governed.—We are now prepared to examine the meaning and validity of that doctrine, promulgated in the Declaration of Independence, and accepted as fundamental in American political philosophy, according to which all governments derive their just powers from the consent of the governed.

Without stopping to consider what the founders of the American Union probably meant by this phrase, it may be here said that the principle stated by it has a validity only in so far as it is held to state or imply that all governments should be so administered as to promote to as high a degree as is possible the good of all the governed; and that, therefore, the governed have at all times the moral right—though not necessarily the legal right—to see to it that this is done, and consequently the right, if there be no better way, of overturning an existing government and establishing in its place one more likely to subserve their own general good. Impliedly, then, the doctrine properly means that every state should be so organized as to render possible and easy the discovery of the best interests of the governed. As, however, generally speaking, these best interests are most certainly to be determined by the intelligent wishes of those concerned, this means, in the first place, that, so far as the state itself is able to provide them, agencies should exist for developing the intelligences of its citizens and thus qualifying them to know their own best interests; in the second place that adequate provision should be made for the free expression by the people of their wishes; and, finally, in the third place, that sufficient guarantees should exist that these wishes when made known will be heeded by those in power.

That the foregoing requirements of an ethically defensible government may be satisfied, it is necessary that all public officials shall be held strictly responsible, politically and civilly, for the manner in which they exercise the powers entrusted to them; that freedom of speech and press shall prevail; that the rights to petition, to assemble peaceably, and to bear arms shall exist; and that political privileges—the suffrage and the right to be elected or appointed to public office—shall be as widely extended as the intelligence and morality of the citizens will permit. Speaking negatively the doctrine of the 'consent of the governed' does not support the legal right, nor, except in extreme cases, the moral right, of each individual citizen to refuse obedience to particular laws which he may consider unjust, nor at will to cast off his allegiance to his state, nor to claim the suffrage or public office as an abstract right.

The ethical right of one people forcibly to subject another people to its political authority, that is, to destroy the sovereignty of its state and annex its territory, as,

for example, the right of the United States to control the political destinies of the Filipinos, or of England to extend her authority over the peoples of the South African Republic (Transvaal), and the Orange Free State, is a somewhat different question from that of the right of a particular government to exercise a control over its own citizens. There is an exceedingly strong presumption not only that a given people best knows its own interests and the means of advancing them, but that, stimulated by the consciousness of national independence, it will develop its latent potentialities in a manner that it will not, or cannot, do when subjected to an alien authority. But this presumption, however strong, is one that may be rebutted. It may be made sufficiently plain that a people, because of a lack of intellectual and moral development or a deficiency in natural ability and temperament, is not able either to perceive its own best interests or so to govern its conduct as to realize them when perceived, or, in determining upon its domestic or foreign policies, to give sufficient weight to the moral and legal rights of other states and their citizens. The interests of civilization are superior to those of any particular people. Judged from this general standpoint, it may, therefore, often happen that the forcible subjection of one people to the political rule of another is justified. The right of course appears most plainly in the case of the subjection of an uncivilized people to a civilized nation, but is not necessarily limited to such a case. The continued unsatisfactory political conditions existing among many of the peoples of South and Central America, of the races inhabiting the Balkan Peninsula and of the whole of the Turkish dominions certainly furnishes to the other states of Europe and America a very strong basis of right to intervention.

Classifications of Governments.—The forms in which communities have sought to realize the idea of government have been divided, from very early times, into three classes: (1), monarchy, that form in which the sovereignty of the state is placed in the hands of a single individual; (2) aristocracy, that form in which it is confided to a select class, supposed to be possessed of peculiar aptitude for its exercise; (3) democracy, that form in which it is retained by the community itself and exercised either directly, as in the small republics of ancient Greece, or indirectly, by means of representative institutions, as in the constitutional states of modern times. Each of these forms of political organization, if called into existence by an expression of the general will of the community, maintained by its consent, and employed for its benefit, is said to be a legitimate government (Aristot. *Politic.* lib. iii. c. 5)—i.e., a government which vindicates the interests of the collective body of the people without needlessly encroaching on individual freedom of action. But each of these legitimate forms was said by the ancient publicists

(Aristot. *ut sup.* and iii. 4, 7) to have a particular degenerate form to which it was prone. Monarchy tended in the direction of tyranny, or a government for the exclusive benefit of the single ruler; aristocracy to oligarchy, or a government for the exclusive benefit of the ruling class; and democracy to ochlocracy, or mob-government—a government in which the majority, necessarily the least instructed and judicious portion of the community, exercised a tyranny over the refined and cultivated few. Through these various forms, in the order above enumerated, each legitimate form being followed by its corresponding degenerate or perverted form, government was supposed to run in a perpetual cycle; the last form, ochlocracy, being followed by anarchy, or no government at all, which formed a species of interregnum so abhorrent to the social and political instincts of mankind as to induce them speedily to revert to monarchy, at the expense of subjecting themselves to a repetition of the misfortunes which they had already experienced. As a refuge from these evils, the so-called mixed government, or government which should combine the elements of order and permanence of two, at least, if not of all the three pure forms of government, while rejecting their tendencies to derangement and degeneracy, is supposed to have been devised. A union of aristocracy and democracy was the form in which Aristotle conceived the mixed government, and spoke of it under the title of the *politeia*. But the tripartite government was not unknown to speculators of even an earlier date. Plato had shadowed it forth in his laws, and Aristotle himself tells us that it had been treated of by other writers (*Politic.* ii. c. 3). Who these writers were has been a subject of much speculation, but there is reason to believe that their works contained mere hints of the principle; and the first writer with whom we are acquainted to whose mind its practical importance was fully present is Polybius, who, with Cicero, by whom he was very closely followed in 'The Republic,' holds the tripartite form to have been realized in the Roman constitution. The most famous instance of the mixed government, however, has been supposed to be exhibited in that balance of powers which has been so often said to form the essence of the English constitution. But in addition to the fact that these are not separate powers, but only separate organs of the one power or sovereignty which in free states is of necessity centered in the general will (see CONSTITUTION), it is extremely doubtful whether any period could be pointed out in the history of any nation, in which the sovereignty did not find expression obviously either through the one, the few, or the many; or whether such a period, if it did exist, was not a mere period of struggle and transition. A still further subdivision divides monarchies into elective and hereditary according to the source whence the monarch derives

his right to office; and into absolute or limited (or constitutional) according as the monarch in the exercise of his authority, is, or is not, controlled by definite constitutional principles and by the action of other governmental officials selected by the people; aristocracies into particular types according to the principle, wealth, or birth, upon which membership in the ruling class is determined; and democracies into direct and indirect according to whether their people directly participate in the control of the state or delegate the exercise of their sovereign powers to officials selected by and responsible to themselves. In the latter case the government is known as a representative democracy or republic. The Constitution of the United States, without defining the term, provides that: 'The United States shall guarantee to every State in this Union a republican form of government. The Federal courts, though they have several times been called upon to construe and apply this clause, have never attempted directly to determine the meaning of the term 'republican form of government.' The eminent constitutional jurist, Judge Cooley, gives, however, the following definition which has been generally accepted as correctly expressing the meaning of the phrase as employed in American law and American political thought:

> By republican government, he says, is understood a government by representatives chosen by the people, and it contrasts on one side with a democracy, in which the people or community as an organized whole wield sovereign powers of government, and on the other with the rule of one man, as king, emperor, czar, or sultan, or with that of one class of men, as an aristocracy. In strictness, a republican government is by no means inconsistent with monarchical forms, for a king may be merely an hereditary or elective executive, while the powers of legislation are left exclusively to a representative body freely chosen by the people. It is to be observed, however, that it is a republican form of government that is to be guaranteed; and in the light of the undoubted fact that by the Revolution it was expected and intended to throw off monarchical and aristocratic forms, there can be no question but that by a republican form of government was intended a government in which not only would the people's representatives make the laws, and their agents administer them, but the people would also, directly or indirectly, choose the executive. But it would by no means follow that the whole body of the people, or even the whole body of adult or competent persons would be admitted to political privileges; and in any republican state, the law must determine the qualifications for admission to the elective franchise.

Another term, often used as synonymous with democracy, is popular government. Strictly speaking, however, latter term should be employed not to designate any distinct form of political organization, but to describe any government the actual administration of which is to a considerable degree subject to the control of the people. A popular government is thus, in effect, a free government and as such is properly to be contrasted with a despotic government in which the will of the ruler or rulers and not that of the ruled controls. In its stricter and more usual sense, a constitutional government is one in which the principles determining its specific character, and the extent and mode of exercise

of its powers, are definitely determined, and, in general, reduced to precise written statement, and embodied in an instrument or instruments which are not subject to abrogation or amendment except according to certain specified formalities. By this means not only are definiteness of authority, and responsibility of those in power secured, but guaranties provided that existing political liberties shall not be changed except under conditions which usually include a popular assent directly or indirectly given.

In almost all constitutional governments the several functions of political rule are so distributed among different organs of government that no one of them is given sufficient power to assume an autocratic, despotic control of the state. Thus in general, the making, the interpreting, and the enforcing of laws are placed in different hands. The executive is thus unable to take legal action without the authorization of the legislature, and the acts of both the legislature and executive are subject to review in the courts. Furthermore, the legislative body is usually divided into two chambers, the approval of both, together with that of the chief executive, being required for a valid act of legislation; executive officials are often elected for but short terms of office, and in case of nonfeasance or malfeasance of office are subject to impeachment and summary removal from office, and subject to civil and criminal suit for any illegal conduct while in office. In the United States of America the most powerful check of all consists in the fact that the courts have the power of declaring void all legislative acts inconsistent with the provisions of the written constitutions of the United States and of its constituent commonwealths. In those European states which possess written constitutions the courts have not this power.

Presidential and Parliamentary Governments.—Presidential government, to accept the excellent definition of Burgess, 'is that form in which the state, the sovereign, makes the executive independent of the legislature, both in tenure and prerogative, and furnishes him with sufficient power to prevent the legislature from trenching upon the sphere marked out by the state as executive independence and prerogative.' Thus the governments of the United States and of Germany are of this type. Upon the other hand, 'Parliamentary government is that form in which the state confers upon the legislature the complete control of the administration of law. Under this form the legislature originates the tenure of the real (though perhaps not the nominal) executive, and terminates it at pleasure; and under this form the exercise of no executive prerogative, in any sense and manner unapproved by the legislature, can be successfully undertaken.' The government of England best illustrates this form of government. That of France may also be placed in this category. Because the real

executive power in a parliamentary government is almost always in the hands of a cabinet of officials holding office only so long as they are able to retain the support of the legislature, this form of political rule is often spoken of as Cabinet government.

The Sphere of Government.—The legal power of a constitutional government at any given time is determined by law The sphere of political control thus marked out includes all those interests which the state has determined require public control. In order to maintain itself as a sovereign, independent body-politic, it is absolutely necessary that the state should obtain sufficient means, and exercise sufficient authority, to protect itself against attacks from foreign sources, and to maintain law and order, that is, to protect persons and their property throughout its own dominions. The powers, the exercise of which is thus called for, may, therefore, be termed 'essential powers,' and in the aggregate they constitute the essential sphere of the state. By some writers they are spoken of as 'police powers.' German writers use this term somewhat differently, designating as a 'Police State' (*Polizeistaat*) one that English and American writers denominate a 'Paternal State.' Contrasted to these essential, or, to use the adjective employed by President Wilson, the 'constituent' functions of government, which must be exercised by a state in one way or another, are what may be called the non-essential or ministrant functions which all civilized states to a greater or less extent exercise. The activities included in this class are those performed by the state for the promoting of the economic, physical, and moral welfare of its people.

As not being absolutely essential to the very existence of the state, there are many who while admitting the necessity for, and the rightfulness of, political control in matters of Police protection and national self-defense, assert that the assumption by the state of a right thus further to control the conduct of its citizens, is an ethically unjustifiable interference with their freedom, even though the aim of such interference is to advance their own good. In order to maintain this position, however, they are obliged to fall back upon a doctrine of 'natural rights,' the invalidity of which is now all but universally recognized. Starting, as from a premise, with the right of a particular state or government to be, as determined by the principles already laid down in this article, the conclusion necessarily follows that, in each individual case, the question whether or not a given matter, whatever its character, shall be subjected to public control, is one the answer to which should be determined wholly by expediency—construing of course expediency so as to include moral as well as material considerations. The arguments of those who urge the establishment of a socialistic or communistic régime are, therefore, not to be met by the simple predication of an abstract individ-

ualistic, *laissezfaire* doctrine, according to which an extension of state activities beyond the mere maintenance of order and national independence, is ethically unjustified whatever the results to which it may lead. Under the head of these non-essentials, may be grouped all those state activities that are educative rather than coercive, informative rather than controlling. Of this character, for instance, is almost all of the work done in the Departments of Labor and Commerce, and of Agriculture, the Bureau of Education, the Fish Commission, and other scientific bureaus of the United States government.

See MONARCHY; DEMOCRACY; REPUBLIC; CONFEDERATION; CONSTITUTION; LIBERTY; EQUALITY; FRATERNITY; FEDERAL GOVERNMENT; STATE; TERRITORY; COLONY; CITY GOVERNMENT; LOCAL GOVERNMENT; REPRESENTATION; REFERENDUM; POLITICAL SCIENCE; CIVICS; CITIZENSHIP; SOCIOLOGY; SOCIAL SERVICE; POLITICAL ECONOMY; CIVIL SERVICE; SENATE; HOUSE OF REPRESENTATIVES; CONGRESS; PARLIAMENT; POLITICAL PARTIES; EXECUTIVE; JUDICIARY; COURT; SUPREME COURT; CHILDREN'S COURT; LAW; CIVIL LAW; COMMON LAW; INTERNATIONAL LAW; JURISPRUDENCE; LABOR LAWS; ARBITRATION; DIPLOMACY; MONROE DOCTRINE; SUFFRAGE; WOMEN'S RIGHTS; SOCIALISM; COMMUNISM; TRADE UNION; INDUSTRIAL UNIONISM; COOPERATION; TAXATION; SINGLE TAX; TARIFF; FREE TRADE; PUBLIC DOMAIN; HOMESTEAD AND LAND LAWS; IMMIGRATION; etc.

Bibliography.—Amos, *Law and Custom of the Constitution;* Aristotle, *The Politics* (Jowett's transl.); Bagehot, *The English Constitution;* Bluntschli, *Staatslehre;* Lord Brougham, *Philosophy of Government;* Bryce, *The American Commonwealth;* Burgess, *Political Science;* Calhoun, *Government;* Cicero, *On the Commonwealth* and *On the Laws;* De Tocqueville, *Democracy in America;* Dicey, *The Law of the Constitution;* Dunning, *A History of Political Theories* (New York 1902); Giercke, *Political Theories of the Middle Ages* (Maitland's transl.); Guizot, *Representative Government,* and *History of Civilization;* Hobbes, *Leviathan;* Jenks, *Law and Politics in the Middle Ages* (New York 1898); Locke, *Civil Government;* J. S. Mill, *Liberty and Representative Government;* Montesqueiu, *The Spirit of Laws;* Mulford, *The Nation;* Plato, *Republic* and *Dialogues* (Jowett's transl.); Puffendorf, *Elements of Univcrsal Jurisprudence;* Rousseau, *The Social Contract;* Rutherford, *Institutes of Natural Law;* Vattel, *Law of Nations;* Wood, *Government and the State* (New York 1902); Woolsey, *Political Science;* and the works of Filmer, Mackenzie and Sidney on *Government.*

GOVERNMENT BY INJUNCTION, a term used to characterize the putting down of strikes by judicial power of laying injunctions. The first direct interference of the national government in labor troubles was the dissolution of the great Pullman strike at Chicago

in 1894, on the ground that it interfered with the carrying of the United States mails. This was an executive act; but the courts have since interfered in cases where violence was making the transaction of government business impossible, and brought irresistible government power to bear.

GOVERNMENT PRINTING HOUSE, a large printing establishment at Washington, D. C., controlled and operated by the government for the publication of congressional proceedings, department reports, scientific bulletins, etc. It is considered the largest printing-office, public or private, in the world. A new building was erected in 1902 for its accommodation at a cost of about $2,500,000. Its floor space represents a total area of 14 acres. More than 4,000 persons are employed in this establishment. The cost of maintaining the establishment approximates $6,000,000 per year.

GOVERNMENT OF THE UNITED STATES. See UNITED STATES.

GOVERNOR, in the United States. The head of an English trading corporation, as the East India Company or the Bank of England, was called the governor; hence it was natural to give that title to the heads of the colonies which grew out of them. These governors were elected by the people in Connecticut and Rhode Island, and down to 1686 in Massachusetts; in the crown colonies they were appointed by the sovereign, and in the proprietary colonies by the proprietor. The name, from the long struggles with the royal governors, had a disagreeable sound in the public ear in many colonies; and when the Revolution swept these away, in several cases they were replaced by councils, of whom the president or chairman was really the governor. Hence, in those times 'President' of a State was often used as a current though not official title. Where and when a single executive was adopted, south of New York he was at first usually chosen by the legislature. At present, in most States the governor has a veto, which may be overridden in all cases by a two thirds vote of both Houses, and in some by a bare majority. Sometimes he has the power of granting pardons; in other cases he is one member of a board of pardons. He sometimes appoints commissions and executive boards. He is always commander-in-chief of the State militia, and is obligated to assist local officers in suppressing insurrections, and is empowered to call on the President for help if necessary; in turn, he is the President's chief agent in furnishing men and supplies in case of national war. And like the President, he sends a message to the legislature at the beginning of each session, recommending such legislation as he wishes.

GOVERNOR or PUMP-GOVERNOR: a valve arrangement connected with the steam pipe and the brake-pipe or train-pipe attached to the air-pump. It is employed to regulate the action of the pump in operating

the air-brakes. It is usually set to maintain a pressure of 70 pounds as indicated by the air-gauge.

GOVERNOR VALVE GEAR: the valve gear or mechanism by which governors regulate the opening and closing of the induction valve in automatic expansion.

GOV'ERNOR'S ISLAND: fortified military post of the United States in the upper harbor of New York, ¾ m. s. of the Battery 6 m. n. by e. of the Narrows, separated from Brooklyn by Buttermilk channel; it is abt. 1 m. in circumference. It contains Fort Columbus in the center, and Castle William on the w., both built 1807–10, the barracks and headquarters of the military dept., of the Atlantic, a depot of the ordnance dept., and a rendezvous of the gen. recruiting service of the U. S. army. Castle William was the first casemated battery erected in the United States. Governor's Island is beautifully laid out. A movement was started 1888–9 to have it transferred to New York for a public park. The fortifications are old, and of no strength against the missiles of modern warfare, and they are so near the city as to afford scarcely any protection from a hostile fleet.

GOWAN, n. *gow'ăn* [Gael. *gugan*, a daisy; *guganach*, abounding in daisies, flowery]: in *Scot.*, a wild daisy. GOWANY, a. *gow'ăn-ĭ*, abounding in gowans.

GOWER, *gow'ẽr*, JOHN: prob. abt. 1325–1408: English minor poet; recently shown to have belonged to the county of Kent. His history is enveloped in obscurity, but he seems to have been one of the most accomplished gentlemen of his time, and to have had considerable landed property. He was a personal friend of Chaucer's, who addressed him as 'O moral Gower' in dedicating to him his *Troilus and Cressida*—an epithet which has indissolubly linked itself to his name. Gower did not long survive his great contemporary. He was a voluminous writer, and produced the *Speculum Meditantis* (a poetical discourse on the duties of married life), in ten books, in French verse (supposed to have perished); *Vox Clamantis* in Latin (of which there are manuscript copies in the Cottonian and Bodleian libraries); and *Confessio Amantis*, by which he is best known, in English. This latter work, at the portentous length of 30,000 verses, was printed first by Berthelet 1573. An excellent edition of the works of Gower was published 1857, edited by Dr. Reinhold Pauli, with a memoir and critical dissertation. Gower is heavy and prosaic in style. His English poem is full of Norman-French words, and in his native tongue he never approached Chaucer's ease and mastery. Yet, his poem is interesting to the scholar and the antiquary, because therein the elements of modern English are found side by side, or scarcely fused together.

GOWK, n. *gowk* [prov. Eng. and Scot. *gowk*, a cuckoo: Icel. *gaukr*, a cuckoo]: one easily imposed on; a sim-

pleton; a fool: V. to make a fool of any one. GOWKIT, a. *gowk'ĭt*, foolish; light-headed. TO HUNT THE GOWK, in *Scot.*, to go on a fool's errand; to send on a fool's errand on April 1st. See GAWK.

GOWLE, n. *gowl* [F. *gueule;* L. *gula*, the throat]: a hollow between hills; a defile between mountains.

GOWLEE, n. *gow'lē* [Hind. *goala;* Mahratta *gawarce*]: a cowherd.

GOWN, n. *gown* [OF. *gone;* It. *gonna*, a gown: W. *gwn*, a gown—from *gwnio*, to sew, to stitch: Gael. *gun*, a gown]: a woman's upper garment; a long, loose, light robe worn by professors, clergymen, barristers, etc. GOWNED, pp. *gownd:* ADJ. dressed in a gown. GOWN'-MAN, or GOWNSMAN, n. a university student. DRESSING-GOWN, a long loose robe worn by gentlemen within doors, especially in the morning before dressing.

GOWPEN, n. *gow'pĕn* [Icel. *gaupn*, *gupn*, the hollow of the hand; Sw. *gopn*]: the hollow of the hand, when contracted in a semicircular form to receive anything; a handful. *Goupins*, both hands held together in the form of a round vessel.

GOW'RIE, CARSE OF. See PERTHSHIRE and CARSE.

GOW'RIE CONSPIRACY: singular event in the history of Scotland; 1600, August. On Aug. 5, as King James VI., then residing at Falkland Palace, in Fife, was going out to hunt, Alexander Ruthven, brother of the Earl of Gowrie, whose father had been put to death for treason 1584, came to his majesty, and informed him that, on the previous evening, he had seized a person of a suspicious appearance, and evidently disguised, with a pot full of foreign gold hid under his cloak, and had confined him in his brother's house at Perth. Conceiving him to be an agent of the pope or the king of Spain, the king agreed to examine the man himself, and, without waiting to change his horse, set out for Perth, attended only by the Duke of Lennox, the Earl of Mar, and about 20 others. Soon after his arrival, while his retinue were at dinner, Ruthven conducted the king up a winding staircase and through several apartments, the doors of which he locked behind him, and brought him at last to a small study, where stood a man in armor, with a sword and dagger by his side. Snatching the dagger from the man's girdle, Ruthven held it to the king's breast, accusing him of the murder of his father, and threatening death if he uttered a cry. The king expostulated: and Ruthven went to consult his brother, leaving the king in charge of the man in armor. In the meantime, one of Gowrie's servants hastily entered the apartment where the king's retinue were, and announced that the king had just ridden off toward Falkland. All hurried into the street, and the Earl of Gowrie, with the utmost eagerness, called for their horses. On Ruthven's return to the king, he declared that the king must die, and proceeded to bind his hands. The king grappled

with him, and a fierce struggle ensued. Dragging Ruthven toward a window looking into the street, which the man in armor had opened, the king cried aloud for help. His attendants knew his voice, and hastened to his assistance. Lennox and Mar, with the greater number of the royal train, ran up the principal staircase, but found all the doors shut. Sir John Ramsay, of the Dalhousie family, one of the royal pages, ascending by a back stair, entered the study, the door of which was open, and seizing Ruthven, stabbed him twice with his dagger, and thrust him down the stair, where he was killed by Sir Thomas Erskine and Sir Hugh Herries. On the death of his brother, Gowrie rushed into the room, with a drawn sword in each hand, followed by seven retainers well armed and was instantly attacked. Pierced through the heart by Sir John Ramsay, he fell dead without uttering a word The inhabitants of Perth, by whom Gowrie, who was their provost, was much beloved, hearing of his fate, ran to arms, and, surrounding the house, threatened revenge. The king addressed them from a window, and admitted the magistrates, to whom he fully related all the circumstances, on which the people dispersed, and he returned to Falkland. Three of the earl's servants were put to death at Perth. The man in armor, the earl's steward, was pardoned. The ulterior purpose of the Gowrie Conspiracy remains in part obscure; though recent discoveries indicate that the object of the conspirators was to possess themselves of the king's person, to convey him by water to Fast Castle, and either to give him up to England, or to administer the government in his name in the interest of that country and of the Presbyterian leaders in Scotland. Most of the documents relating to the plot are printed.

GOWT, n. [Dut. *goot;* Low Ger. *góte*]: sluice in a sea-embankment for letting out the land water when the tide is out, and preventing the ingress of the sea-water.

GOYA Y LUCIENTES, *gō'yâ ē lô-thē-ĕn'tĕs*, Francisco: 1746, Mar. 31—1828, Apr. 16; b. Fuente de Todos, Aragon: most distinguished painter of the new Spanish school. He received his first education in art in the acad. at San Luis, Saragossa. His paintings for the royal tapestry manufactory gained the approbation of the celebrated Mengs. His scenes from the common life of the Spanish people excited special admiration; but all his productions during this early period—to which belong the altar-piece and the crucifix at the entrance to the choir of the church of San Francisco al Grande in Madrid—are marked by simplicity of composition, charming truthfulness, and a natural and effective chiaroscuro. In 1780, he was elected member of the Acad. of San Fernando. From this time, the influence of Velasquez and Rembrandt is observable in his paintings. Among the most celebrated of these is his portrait of Charles IV., for which he was made court painter. In general, his portraits were executed with great felicity

and case. In 1824, he went to Paris for his health, and died at Bordeaux. Besides his works in oil-color, Goya is celebrated for his essays in fresco-painting, etching, lithography, and in almost every department of his art.

GOYAZ, *gō-yâz'*, Brazil, a state completely enclosed between the states of Maranhão, Piauhy, Bahia, Minas Geraes, São Paulo, Matto Grosso, and Pará. Its area is estimated at 747,311 square kilometres,or, say, 287,714 square miles; but, as a large part of the Araguaya-Tocatins basin is unexplored, a precise statement in regard to the extent of its territory cannot be justified. The Goyaz plateau with the Pyreneus Mountain range constitute the water-shed which divides the basin of the Tocatins and Araguaya rivers from the São Francisco and Paraná basins; the headwaters of the Araguaya and the Paraguay are near one another; and thus the point of divergence of great river systems is found within this state. The climate of the plateau is excellent; among the mountains extremes of heat and cold are felt; and large districts are well adapted to agriculture. Forests extend along the river-courses, while the elevated lands of the interior have only occasional clusters of trees. The chief products are tobacco, rubber, and cattle; the gold and diamond washings which at one time were supposed to be important now yield very little. The capital, Goyaz, formerly called Villa Boa, has about 8,000 inhabitants. The population of tne state was given as 260,-395 in 1901, but of that number nearly all were Indians or Mestizos, the civilized element being inconsiderable as yet. The special interest attached to this state is due to a circumstance which is mentioned in a geographical sketch of Brazil (Washington 1901; compiled by the Bureau of the American Republics), in the following terms: 'This state enjoys a splendid climate, and has been selected for the site of the future capital of the republic, the constitution providing for its location on the plateau of Goyaz. A special commission, at the head of which is the director of the observatory of Rio de Janeiro, has already marked the site for the new capital, which is a space 14,400 kilometres square on the Upper Tocatins, in the Pyreneus range of mountains. It has an elevation of from 200 to 300 metres above the level of the plateau and is drained by numerous streams of pure water, being the centre of the three hydrographic systems of Brazil. . . . It is here, near the point of divergence of her three great rivers, that Brazil wishes to establish the national capital.' But the site thus selected has no natural means of communication with the Brazilian coast. The Tocatins-Araguaya is navigable for only about one tenth of its entire length; its course is broken by falls and rapids, and as it approaches the Gulf of the Amazon it becomes very shallow. Canals and railways would be required in order to make the rivers commercial highways; moreover the state is without seaboard—is, indeed, far inland. The isolation of the proposed capital suggests that of Bogotá.

GOZO, or Gozzo, *gŏt'so* (called by the Romans *Gaulos*): island in the Mediterranean, belonging to Britain; about 10 m. long, and 5 m. broad; 36 sq. m. Its surface is agreeably diversified, and it has many fertile valleys. It appears to have been formerly connected with Malta, from which it is now separated by a channel four m. wide. Gozo is interesting to the naturalist, while the cyclopean walls of the 'Giant's Tower' and Roman monuments of a later period excite the attention of the antiquary. The island abounds in game, and is frequented by sportsmen. It produces much grain and cotton, and is celebrated for cattle and for a breed of large asses. From the circumstance of its having two harbors, it is important in a commercial and nautical view. The chief town is Rabato, near the center of the island. The British gov. resides in the Castel del Gozzo. Pop. 17,000.

GOZZOLI, *gŏt'so-lē*, Benozzo: born at Florence about the beginning of the 15th c.; died 1485. He studied under Fra Angelico, whose excellence as a painter of sacred subjects he equalled, perhaps surpassed. A glow of rejoicing life seems infused into all Gozzoli's productions. His chief works bearing traces of his master's influence are frescoes in the churches of Orvieto and Rome; his own style being visible in his paintings by command of Pietro de' Medici, in a chapel of the Medici, now Riccordi Palace, Florence. Gozzoli's fame rests on the immense frescoes on the n. wall of the famous cemetery, or Campo Santo of Pisa. This wonderful series of paintings, aptly termed by Vasari *una terribilissima opera* ('a terrific work'), was undertaken by the artist at the age of 60, and accomplished in 16 years. The scenes, all scriptural, are 24 in number, and are still in excellent preservation.

GRAAF, *grâf*, Regnier de: 1641–73; b. Schoonhove: Dutch physician. He studied at the Univ. of Leyden; and when only 23 years of age, published his *Disputatio Medica de Natura et Usu Succi Pancreatici*, which, though containing several errors, gained him great reputation. After a short residence in France, where he took his doctor's degree at Angers 1665, he returned to Holland, and settled at Delft, where his practice was large. He invented those injections of the blood-vessels which, improved by Swammerdam and Ruysch, are the basis of our knowledge of most of the tissues of the body. Some dissertations on the organs of generation in both sexes involved him in a prolonged and angry controversy with Swammerdam; and Haller reports, on authority not known, that his death, at Delft, was occasioned by jaundice, brought on by the excitement of this controversy. All his works were published in one octavo vol. *Opera Omnia*, 1677; republished 1678 and 1705.

GRAAF'IAN VES'ICLES: see Ovary.

GRAB, v. *grăb* [Sw. *grabba*, to grasp: Dut. *grabbelen*, to seize greedily—from *greb*, a dung-fork: Icel. *greipa*,

to seize: Gael. *grab*, to catch: Pol. *grabki*, a rake, a fork]: to seize; to grasp suddenly; to clutch. GRAB'BING, imp. GRABBED, pp. *grăbd*. GRABBLE, v. *grăb'bl*, to grope; to feel in muddy places. GRAB'BLING, imp. *-blĭng*. GRABBLED, pp. *grăb'bld*.

GRACCHUS, *grăk'ŭs:* Roman family of the gens Sempronia, which contributed several famous citizens to the state.—First was TIBERIUS SEMPRONIUS GRACCHUS, consul B.C. 238, who conducted some warlike operations in Corsica and Sardinia.—Another TIBERIUS SEMPRONIUS GRACCHUS distinguished himself in the second Punic war, and for his success in opposing Hannibal, was honored with the consulship B.C. 215 and 213. In those days of despondency, he did much to revive the spirit of the senate and people; with the allies, and 8,000 *volones*, or volunteer slaves (who afterward gained their liberty as a reward), he withstood the Carthaginians in s. Italy, defeated Hanno, and held in check Hannibal himself; but after many victories, he lost his life, either in battle with Mago, or by treachery: Hannibal honored him with a splendid funeral.

Passing by some Gracchi of minor note, as the augur of B.C. 203, the tribune of B.C. 189, and others, we come to TIBERIUS SEMPRONIUS GRACCHUS, b. abt. B.C. 210; father of those two reformers and friends of the people whose fame has overshadowed all the others. He was for many years foremost in the state; successively tribune, ædile, pretor, consul (twice), and censor, and distinguished in several wars. He introduced some important constitutional changes, and was often employed on foreign embassies, in which his judgment and conciliatory spirit were of great service to the state. He married Cornelia, youngest daughter of P. Scipio Africanus, by whom he had 12 children. Nine of these died in youth; a daughter, Cornelia, married Scipio Africanus the younger. For the history of these two sons see below.

GRAC'CHUS, CAIUS SEMPRONIUS: Roman popular leader: abt. B.C. 159–121; son of Tiberius Sempronius Gacchus (b. abt. B.C. 210—see GRACCHUS, Family). He had much greater natural powers than his older brother, whose death while Caius was serving in Spain under Scipio Africanus, deterred him for some years from entering into public life. The nobles seeing his great abilities, and fearing his influence with the people, endeavored to keep him as long as possible on foreign service in Sardinia and elsewhere. At length he unexpectedly returned to Rome, being urged by his brother's shade, as was said, to enter on his great mission. Goaded by the persecution and groundless accusations of his enemies, he stood for the tribuneship, and was elected B.C. 123. After bringing forward some measures to take vengeance on his brother's murderers, he set himself to carry out the agrarian law, which, though not repealed, had by the machinations of the nobles been kept in abey-

ance. The two great aims of his legislation—viz., to improve the condition of the poor, and to curtail the power of the senate and nobles—were now prosecuted with the utmost vigor, and with unflinching steadiness. To develop the resources of Italy, and at the same time to employ the poor, he made new roads throughout all parts of the country, repaired old ones, and erected milestones. By his zeal, and by his unwearied industry in personally carrying out his own measures even to superintending the execution of the public works, and by his affability and kindly good nature, he gained the esteem and approbation of those with whom he came in contact. With the equites and the poorer classes, he was in special favor. But he at length fell, as his brother had done, by the intrigues of the nobles. One of his colleagues, M. Livius Drusus, was bribed by the opposite faction, and soon succeeded in undermining the influence of Caius by far surpassing him in the liberality of his public measures, and by his benefits to the commons. Gracchus having stood for the tribuneship a third time, was rejected, and having incited the populace to violence, the consul Opimius who had been armed for the purpose with absolute power, attacked the party of Caius. A fearful struggle took place in the streets of Rome, in which 3,000 men are said to have perished. Many others were imprisoned, and afterward put to death. Caius who had held aloof from the fight, fled at last, and escaped to the grove of the Furies with a single slave, whom he commanded first to slay his master, and then himself. The people saw too late, their guilty folly, and endeavored to atone for their crime by erecting statues to the brothers Gracchus, by declaring sacred the spots where their blood had been shed, and by offering sacrifices to them as deities. The character and aims of Caius doubtless compare favorably with those of his adversaries; yet he lacked his brother's sincerity and disinterestedness.

GRAC'CHUS, Tiberius Sempronius: Roman patriot: abt. B.C. 168–133; son of Tiberius Sempronius: Gracchus (b. abt. B.C. 210—see Gracchus Family). He was educated with great care by his excellent mother (his father having died while he was yet very young). He saw military service first under his brother-in-law, Scipio Africanus the younger, whom he accompanied to Africa. He was present at the capture of Carthage, and is said to have been the first of the Romans to scale the walls. B.C. 137, he acted as questor to the army of the consul Mancinus in Spain, where the remembrance of his father's good faith and clemency was so fresh after 40 years' interval, that the Numantines would treat with no other Roman but the son of their former benefactor. He was thus enabled to save from utter destruction a defeated army of 20,000 Romans who were at the mercy of the Numantines. But the peace was considered by the aristocratic party at Rome disgraceful to the national

honor, and was repudiated, Mancinus being stripped naked, and sent back to the Numantines, that the treaty might thus be rendered void. Disgust and disappointment at this result are said by some, on insufficient evidence, to have determined Gracchus to espouse the cause of the people against the nobles: a much more feasible ground for his conduct is found in the oppressed state of the commons at the time. Being elected tribune he endeavored to reimpose the Agrarian Law of Licinius Stolo, and after violent opposition on the part of the aristocratic party, who had bribed his colleague M. Octavius Cæcina, he succeeded in passing a bill to that effect. (For a detailed account of the measure, see AGRARIAN LAW.) Tiberius Gracchus, his brother Caius, and his father-in-law Appius Claudius, were appointed triumvirs to enforce its provisions. Meantime, Attalus, King of Pergamus, died, and bequeathed all his wealth to the Roman people. Gracchus proposed that this should be divided among the poor, to enable them to procure agricultural implements, and to stock their newly acquired farms. It is said that he also intended to enlarge the franchise, and to receive Italian allies as Roman citizens. He also diminished the time which citizens were required to serve in the army. But fortune turned against the good tribune. He was accused of having violated the sacred character of the tribuneship by the deposition of Cæcina, and the always fickle people in large numbers deserted their champion and benefactor. At the next election for the tribuneship, his enemies used all efforts to oust him; and a violent struggle having arisen between the opposing factions, Gracchus was slain, with more than 300 others. His surviving friends were imprisoned, exiled or put to death.

GRACE, n. *grās,* [F. *grace,* favor—from L. *grātiă,* favor, grace—from *gratus,* pleasing: Lith. *grazus,* fair, agreeable: Gael. *gràdh,* love, fondness]: favor; goodwill: the free and unmerited favor of God; good disposition proceeding from Divine favor; a state of reconciliation to God; mercy; pardon; the Gospel; elegance; any natural or acquired excellence; behavior, considered as *good* or *bad*—as, he did it with a very *bad grace;* privilege; a short prayer before or after a meal; the title used in addressing a duke or an arch-bishop; act or decree of a university: V. to adorn; to honor. GRA'CING, imp. GRACED, pp. *grāst:* ADJ. endowed with grace; in *OE.,* virtuous; chaste. GRACE'FUL, a. *-fûl,* elegantly easy—used with reference to motion, looks, and speech; possessing an agreeable dignity of manner. GRACE'FULLY, ad. *-lĭ.* GRACE'FULNESS, n. GRACE'LESS, a. *-lĕs,* coarse; rude; wicked; depraved. GRACE'LESSLY, ad. *lĭ.* GRACE'LESSNESS, n. GRACIOUS, a. *grā'shŭs,* favorable; kind; disposed to show kindness or favor. GRA'CIOUSLY, ad. *-lĭ.* GRA'CIOUSNESS, n. kind condescension; mercy. GRACE-NOTES, or GRACES, in *music,* ornamental

notes added to the principal ones to increase their effect, or for mere embellishment; e.g., trills, turns, beats, etc. GOOD GRACES, *grā'sĭs*, favor; friendship. THE GRACES, in *anc. myth.*, three beautiful sisters who attended on Venus, and who were said to confer beauty; beauties; arts of pleasing. GRACE AT MEAT, thanks to God before or after a meal. MEANS OF GRACE, the methods or ways appointed by God to obtain His mercy and love, as, prayer, worship, the sacraments, preaching, etc. DAYS OF GRACE: see BILL: DAY. GRACE-CUP, in *former times*, the last cup of liquor drunk before retiring to rest. AIRS AND GRACES, amusing acts of affectation.—SYN. of 'grace, n.': charm; comeliness; kindness; mercy; privilege; beauty;—of 'gracious': merciful; benignant; benevolent; beneficent; friendly.

GRACE: expression frequently used in Scripture and in theological discussion, denoting free and unmerited loving kindness. According to Aristotle, this is the proper meaning of *charis* (Gr. grace), even when applied to man. It is a benefit springing out of the liberality and freeheartedness of the giver, and bestowed without any preceding claim on the part of the receiver, or any subsequent compensation by him in view. Applied to God in the New Testament and in theology, it denotes the free outcoming of His love to man; and when man, on the other hand, is said to be in a state of *grace*, it implies that he is in the recipiency of this divine love. The apostle Paul draws a sharp contrast (Rom. xi.) between *charis* and *erga* (Gr. works), as mutually excluding one another, when considered merely as the *ground* of man's salvation.

Theologians have distinguished grace into *common or general*, and *special or particular*. *Common* grace is supposed to denote the love which God has to all men, and the light of nature and of conscience which they all receive and possess. *Special* grace is the love which God has for His elect people, and by which He saves them from their sins. This *special* or *saving* grace is sometimes also divided in various ways, and spoken of as electing, justifying, sanctifying grace; also in respect of man, as *imputed* grace—i.e., the grace of Christ's righteousness imputed or reckoned to the account of those that believe on Him, and as *inherent* grace—i.e., the grace of holy and pious dispositions wrought within the heart by the Spirit of God. Grace is spoken of also as *efficacious* and *irresistible*, and the relation in which the elect or believing people stand to God is represented as a *covenant of grace*, in contrast with the primitive relation which Adam bore to his Maker before the fall, which is called a *covenant of works*. See COVENANT, in Theology.

All these theological distinctions have arisen in the course of extended argument and discussion on divine truth. They are of human wisdom, and are not found —at least in their more technical sense—in the New

Testament. The *charis* or grace of the apostle Paul is not a logical distinction but a spiritual and vital fact. It is the loving aspect of God manifested in His Son Christ Jesus toward the sinner—toward all sinners, whereby all who confess and forsake their sins have free access into His favor, and receive the 'adoption of sons.' The technical distinctions of theology doubtless have value in their proper place, i.e., as merely human science: thus limited and rightly used, they mark the course of past controversy—they give precision to theological thought—and when not allowed to deface the simple and august proportions of God's revealed truth, they may teach needful and important lessons.

GRACES, *grās'ĕz:* in ancient mythology, goddesses of grace, favor, and gentleness, the sources of all grace and beauty. They appear in Homer in indefinite numbers as the attendants of Cytherea (Venus), whom it is their office to bathe and anoint. Hesiod and most other poets mention three Graces—Aglaia, Thalia, and Euphrosyne, daughters of Zeus and Eurynome. Their worship is said to have been introduced into Greece first at Orchomenos, in Bœotia, by Eteocles. The Lacedemonians and Athenians originally recognized only two Graces, called, by the former, Phænna and Kleta; by the latter, Hegemone and Auxo. In the early ages, the Graces were represented in elegant drapery; at a later period, slightly draped or entirely nude. They appear holding each other by the hand, or locked in each other's embrace.

GRACIAS Á DIOS, *grâ'sē-âs â dē'ōs,* CAPE: headland on the Mosquito coast, extreme e. end of Honduras, Central America; lat. 14° 55′ n., long. 83° 15′ w.; at the mouth of the Segovia river. It was discovered by Columbus on his fourth voyage, and in gratitude for having found a smooth harbor after much beating against the winds and struggling with adverse currents he named it 'Thanks to God.'

GRACILARIA, n. *grăs-ĭ-lär'ĭ-a* [L. *gracilis,* thin, slender]: typical genus of *Gracilariidæ,* a family of moths, group *Tineina.*

GRACILIS, n. *grăs'ĭ-lĭs* [L. thin, slender]: in *anat.* slender muscle of the thigh, connecting it with the trunk; called also abductor gracilis.

GRACIOSA, *grâ-sē-ō'sâ:* one of the Azores Islands (q.v.), seventh of that group in population and importance.

GRACK'LE. See GRAKLE.

GRADATION, n. *grā-dā'shŭn* [F. *gradation*—from L. *grădātĭōnem,* the making a series of steps—from *grădus,* a step]: a regular advance from one degree or state to another; regular progress step by step; order; series. GRADA'TIONAL, a. according to gradation. GRADA'TIONED, a. *shŭnd,* formed by gradation. GRADATORY, n. *grăd'ă-*

tėr-ĭ, the steps from the cloisters into the church; a proceeding step by step. GRADE, n. *grād* [F. *grade*, a degree—from L. *grădus*, a step]: a degree or rank in order or dignity; a step or degree in any series: V. to cut or reduce to the proper levels as a canal or road. GRA'DING, imp. GRA'DED, pp. GRA'DIENT, n. *-dĭ-ĕnt*, the slope or incline, frequently of a railroad; in *heraldry*, applied to a tortoise walking. GRADUAL, a. *grăd'ū-ăl* [F. *graduel*—from L. *gradŭālis*—from *grădus*]: advancing step by step; proceeding by degrees; regular and slow; in *liturgy* (see below). GRAD'UALLY, ad. *-lĭ* by degrees; step by step. GRAD'UAL'ITY, n. *-ĭ-tĭ*, progression by degrees. GRAD'UATE, n. *-ū-āt* [mid. L. *graduātus*]: one who has received an academical degree: V. to divide any space into small regular intervals or parts; to mark differences; to change gradually. GRAD'UATING, imp. GRAD'UATED, pp. GRAD'UATESHIP, n. the state of being a graduate. GRAD'UA'TION, n. *-ā'shŭn* [mid. L. *gradŭātĭō-nĕm*]: regular progression; act of marking or dividing into degrees; the bestowal of an academical degree. GRADUATION ACT, of 1854, Aug. 4. 'An Act to Gradually Reduce the Price of the Public Lands to Actual Settlers.' All public lands which had been in the market for 10 years and upward prior to the passage of the act were to be sold for $1 per acre; all 15 years, 75 cents; all 20 years, 50 cents; all 25 years, 25 cents; all 30 years, 12½ cents—except United States reservations, grants to States for railroad purposes, or mineral lands held at over $1.25 per acre. No one was to have over 320 acres including lands previously taken up. GRAD'UATOR, n. *-tėr*, an instrument for dividing lines into equal parts; an instrument used in vinegar making. GRADUS, n. *grăd'ŭs* [L.]: a dictionary for Latin or Greek verse-making, the full title being *Gradus ad Parnassum*, a step to Parnassus, the abode of the Muses.

GRÄDENER, KARL: German musician: b. Rostock, 1812; d. 1883. He received his early musical education under the violoncellist Mattstadt and others and later studied at Kiel, subsequently becoming director of music at the university in that city, a position he held for ten years. He founded an academy for the study of singing at Hamburg, and from 1851–61 conducted this himself. He then became associated with the Vienna conservatory, where he stayed three years, and finally was appointed president of the Tonkünstler-Verein of Hamburg. His compositions are distinguished by fine harmonic effects, and include two excellent symphonies, much chamber-music, the oratorio *Johannes der Taüfer*, and an overture to *Fiesco*, a pianoforte concerto.

GRAD'UAL, in the Liturgy of the Roman and other Western Churches: that portion of the mass between the epistle and the gospel, consisting of a few verses of Holy Scripture, usually from the Psalms. It was called originally 'Responsum,' or 'Cantus Responsorius;' but.

probably for distinction from other portions of the service called by the same name, its present appellation has been substituted. The name 'gradual' is derived from the place at which this response was chanted, which was either the ambo or chanting pulpit approached by 'steps' (*gradus*), or the 'steps' themselves, whether of the ambo or of the altar. Originally, as we find from St. Augustine, the gradual response consisted of an entire psalm, and in the mass or the first Sunday in Lent the entire xci. (xc. in the Vulgate) psalm is chanted. In the Ambrosian Liturgy, the gradual is partly from the Old and partly from the New Testament. Strictly, only the first sentence was called the gradual; the remainder was called the 'verse.' The gradual in the Roman Liturgy, is always followed by the 'alleluia,' except in penitential time, when a slow and mournful chant, called the 'Tract,' is substituted. See GRADUALE.

GRADUALE, *grăd-ū-ā'lē:* the music of the Gradual (q.v.) in the Roman Liturgy. It is performed during mass after the epistle is read, and it is said to have been used from the earliest times to allow the officiating priest time to take his place on the steps of the reading-desk, or on the steps of the gospel side of the altar. The music is according to the character of the words, and may be either aria, duet, or chorus. The composition must not be long, as the priest has little ceremony to go through during its performance. The best specimens of the graduale are Haydn's *Insanœ et Vanœ Curœ; Salve Regina;* or Mozart's *Misericordias Domini; Sancta Maria; De Profundis*, etc.

GRAD'UAL PSALMS, or 'PSALMS OF THE STEPS,' or 'SONGS OF DEGREES': in both the Hebrew and the Christian service-books, the fifteen psalms, cxx.–cxxxiv. (cxix.–cxxxiii. in the Vulgate). The origin of the name is uncertain. The rabbins trace it to a fabulous incident connected with the building of the second temple; others explain it as an allusion to the 15 steps by which (Ezekiel xl. 22–26) the temple was reached; others, again, regard these psalms as containing a prophetic allusion to the return from captivity, which, in the language of the Jews, was 'a going up,' psalm cxxxiv. being the full outburst of exultation at the accomplishment of that great object of hope and longing. These psalms, in the Roman Church, form part of the office of each Wednesday during Lent.

GRADUA'TION: art of dividing mathematical, astronomical, and other instruments. The simplest problem in graduation is the dividing of a straight line, such as an ordinary scale or rule. This is commonly done by copying from a standard scale, for which purpose a dividing square and a suitable knife for cutting the divisions are used. The dividing square is a hard steel straight-edge, with a shoulder at right angles like a carpenter's square. This is made to slide along the

standard scale, and halt at each required division, when a corresponding one is cut upon the rule, etc., by using the steel straight-edge as a guide to the knife. The *original graduation* of a straight line into equal divisions, as in making a first standard scale, etc., is performed on the principle either of *bisection* or of *stepping*. In bisecting, the points of a beam-compass (see COMPASS) are adjusted to nearly half the length of the line to be divided; one point is then placed at one end of the line, and a faint arc struck toward the middle: this is repeated at the other end; the small distance between these arcs is then carefully bisected with the aid of a finer pointer and magnifier, which gives an accurate half of the line. The half thus obtained is again bisected in like manner, and these quarters bisected again, and so on until the required subdivision is attained. Stepping is performed with delicately pointed spring-dividers, which are set at once as nearly as possible to the opening of the small division required; then the points are made to step on, leaving at each step a very fine dot; and when it is found that the last dot either falls short of or overpasses the end of the line, the opening is adjusted accordingly, until perfect accuracy is obtained. Thus, if a line were divided into a thousand parts, and each division were $\frac{1}{1000}$ too long or too short, the error would amount to a whole division at the end of a thousand steps. The method of bisection is practically the most accurate, and has been adopted by eminent artists in original graduation. Curved li are divided on this principle. The chord of an arc of 60° is equal to the radius; therefore, the opening of the compasses required for striking the circle gives this arc at once to start with. An arc 90°, or a quadrant, is obtained by bisecting 60°, and adding the half. By continual bisection of 60°, the finer graduations are produced. The amount of care, patience, skill, and delicacy of touch required in the original graduation of important astronomical instruments, is such that not above one or two men in a generation have been found competent to the task, and these have become almost as famous as the astronomers who have successfully used the instruments. Graham, when dividing the mural quadrant for the Greenwich Observatory, measured his larger chords from a scale made for the purpose; but before laying these down on the quadrant, he left the scale, beam-compasses, and quadrant to stand for a whole night, in order to acquire exactly the same temperature: neglect of this precaution would have involved a notable amount of error. The necessity of such extreme accuracy arises from the application made of these divisions. When, for example, the mariner determines his latitude by taking the meridian altitude of the sun, the graduated arc of the limb of the sextant or quadrant used represents the

curved surface of the globe, and the error is magnified just to the same extent as the radius of the earth exceeds that of the divided arc of the instrument.

The methods of *original graduation* above described are not practically adopted except for the largest and most important astronomical or geodesical instruments. Ordinary instruments are graduated by dividing plates or engines which copy and adapt a set of already existing divisions. The dividing-plate for common purposes, such as dividing compass rings, etc., is a divided circle with a steel straight-edge, made movable on the axis or arbor of the plate in such a manner that its edge during every part of its revolution shall fall in the exact line from centre to circumference. The ring, protractor, or other instrument to be divided, is clamped upon the plate with its centre exactly coinciding with that of the plate, and the straight-edge is moved round, and made to halt at the required divisions on the circumference of the dividing-plate, and by using the steel straight-edge as a guide, corresponding divisions are marked off on the concentric arc of the instrument to be divided. *The dividing-engine* is a very complex machine, requiring the greatest accuracy and care in its construction; so much so, that the possession of a good one may sometimes afford a good income, with a moderate amount of labor in using it. Among the most celebrated dividing-engines may be mentioned those of Ramsden, Troughton, Simms, and Ross. Their principal part consists of a large circle divided with extreme care by original graduation. This wheel is racked on its edge with teeth as equal and accurate as the divisions; a very carefully constructed endless screw works in these teeth, and is moved through any given number of revolutions, or any measured fraction of a revolution, by means of a treadle or other suitable power, thus making the requisite steps for each division; another part of the machine cutting a fine line at the moment of the halt of each step. These divisions are cut upon an arc of silver, gold, or platinum, which is soldered or inlaid upon the limb of the instrument, the precious metals being used, on account of the oxidation to which common metals are liable.

GRADY, *grā'dĭ*, Henry Woodfen, American journalist and orator: b. Athens, Ga., 1850, May 24; d. Atlanta, Ga., 1889, Dec. 23. He was graduated from the Univ. of Georgia in 1868, having previously, during the last days of the Civil War, served for a brief period in the Confederate army. In 1868-70, he studied at the Univ. of Virginia, and in the latter year began his journalistic career as a contributor to the *Atlanta Constitution*. Subsequently he edited the *Courier* at Rome, Ga., and later established and edited the *Daily Commercial* at the same place; but failing in this enterprise, he became the Georgia correspondent of the *New York Herald* (1871), and the same year purchased an interest in the *Atlanta Herald*, which suspended in 1876. He then

established the *Courier*, which proving unsuccessful he purchased a fourth interest in the *Constitution*, of which he remained editor and part owner until his death. He gained a high reputation as one of the most brilliant editors of the South, and made the influence of his paper felt throughout the nation. He also acquired a local reputation as an orator, mainly through his lecture, "Just Human," first delivered at Atlanta. In 1886, at the annual banquet of the New England Society in the city of New York, he delivered an address on "The New South," which was widely copied and gave him national prominence. From that time until his death he became a popular lecturer and was in frequent demand in various parts of the country. One of his best known lectures, which has been styled his greatest effort, was entitled, "The Future of the Negro," which he first delivered in December, 1889, before the Merchants' Association of Boston. He was the first among the Southern leaders to express the views of the more enlightened classes of his section on the subject of the Civil War, asserting that the "struggle between the States was war and not rebellion," but at the same time expressing a willingness to be identified with the united nation in its upward progress. He declined all offers of public office, but was frequently mentioned for nomination to the United States Senate. See the *Life* by Lee (1896).

GRÆ'CIA, Mag'na. See Magna Græcia.

GRAF, *grâf:* German equivalent for Count (q.v.), *Comte*, Comes, and for (English) Earl (q.v.). The etymology of the word is disputed, but the most probable conjecture is that it springs from the same root with the modern German *raffen* and the Anglo-Saxon *reafan*, to snatch or carry off hastily; and also with our words *reve, greve*, and the last syllable of *sheriff*. If this view be correct, the G., in all probability, was originally a fiscal officer, whose duty it was to collect the revenue of a district. The title appears first in the *lex salica* (compiled in the 5th c.), under the Latinized form of *Grafio;* later, the office is often designated by the Latin equivalent of *Comes*. Charlemagne divided his whole kingdom into Graf-districts (*Grafengaue*) or counties, each of which was presided over by a graf. The people were in the habit of appointing a representative called the *Cent-graf* to attend to their interests with the G., and probably, if necessary, to appeal from his decisions to the central government. There were also, the *Stall-graf*, or stable-graf; the *Comes Stabuli*, or constable of later times; the *Pfalz-graf* (*Comes Palatii*), who presided in the domestic court of the monarch, which as such was the highest court in the realm; the *Send-graf*, who was sent as an extraordinary deputy of the king to control the ordinary *Gau-grafen;* and lastly, the *Mark-graf*, or marquis, on whom the important duty of defending the border-lands devolved.

GRÄFE, *grā'fĕh*, ALBRECHT VON: oculist: 1828, May—1870, July 18; b. Berlin; son of KARL FERDINAND VON GRÄFE. He studied mathematics, natural science, and medicine, and applied himself particularly to ophthalmology in Prague, Vienna, Paris, and Berlin. In 1850 he returned to Berlin, and established a private institution for the treatment of the eye; 1853 was appointed teacher of ophthalmology in the University of Berlin, 1856 extraordinary prof., and 1866 ordinary professor there; and 1855 founded the *Arehiv für Ophthalmologie*, to which he contributed his most important technical papers. His discovery of the methods of treatment for glaucoma—previously deemed incurable—and for the removal of cataract, gave him wide renown. His chief papers were *Physiology and Pathology of the Oblique Muscles of the Eyeball; Double Vision after Operations for Strabismus; Diphtheritie Conjunetivitis; Effeet of the most Refrangible Solar Rays upon Sensation; Treatment of Glaucoma by Iridectomy; and Cerebral Causes of Blindness.* His nephew, ALFRED KARL (b. 1830, Nov. 23), was his asst. several years, founded an ophthalmic institute, and was the first to secure recognition in the Prussian universities for the study of the eye as a special science. He graduated at Halle, and was professor there.

GRÄ'FE, KARL FERDINAND VON: 1787, Mar. 8—1840, July 4; b. Warsaw: surgeon. He graduated in medicine at the University of Leipsic 1807, was the same year appointed private physician to the Duke Alexius of Anhalt-Bernburg, became prof. of surgery in the University of Berlin 1811, and during the war with Napoleon was supt. of military hospitals. He returned to the Univ. on the conclusion of peace, and was appointed a member of the army medical staff, and director of the Frederick-William Institute, and of the Medico-Chirurgical Acad. In his special line of surgery he invented new instruments, and discovered new methods of treatment. He died in Hanover while preparing to operate on the eyes of Crown Prince George.

GRAFF, *grâf*, FREDERICK: 1775, Aug. 27—1847, Apr. 13; b. Philadelphia: engineer. He learned the carpenter's trade, studied drawing, and became associated with H. B. Latrobe in erecting the first waterworks in Philadelphia 1795. He was chosen supt. and engineer of the works 1805, and 1811 began building the great works at Fairmount. He substituted iron pipes for the wooden ones previously used, and devised a variety of mechanical contrivances including fire-plugs and stop-cocks. His success at Fairmount led to requests for his aid from nearly 40 corporations in the United States about to construct waterworks. His labor on the Philadelphia water system extended over 42 years, and a handsome monument was erected in his honor at Fairmount.

GRAFFITI, *grâ-fē'tē* [Ital. *graffito*, a scratching]:

class of ancient inscriptions to which attention has recently been called, and of which several collections have been made. The graffito is a rude scribbling or scratching with a stylus, or other sharp instrument, on the plaster of a wall, a pillar, or a door-post. Such scribblings are frequently found on the substructions of Roman ruins, as in the Golden House of Nero, the palace of the Cæsars, and the Palatine, and in still greater numbers in Pompeii and in the Roman catacombs. Their literary value, of course, is very slight; but as illustrating the character and habits of a certain class of the ancient Romans, and what may be called the 'street-life' of the classic period, they are deserving of study. A small selection of Pompeiian graffiti was published 1837 by Dr. Wordsworth; but the most popular collection is that of Padre Garrucci, a Neapolitan Jesuit, published, Paris 1856. Greek graffiti occasionally are found upon Roman ruins; but graffiti usually are in Latin, and in a few instances at Pompeii, in the ancient Oscan. Some are idle scribblings, such as we may suppose some loiterer to indite at the present day; thus, some lounger at the door of a wine-shop at Pompeii amuses himself by scratching on the door-post the tavern-keeper's name—*Taberna Appii* ('Appius's Tavern'). In other cases we meet with some scrap of rude pleasantry or scandal, such as frequently defaces the walls of our own towns; thus, *Auge amat Arabienum* ('Auge is in love with Arabienus'). Many rude sketches also are found on the walls, some evidently caricatures, others seriously meant, and grotesque from the extreme rudeness. Many of the subjects of these sketches are gladiatorial.

By far the largest proportion of the graffiti are from Pompeii, but many have been discovered at Rome also, and some are very interesting. One discovered by Father Garrucci 1856, in a subterranean chamber of the palace of the Cæsars, possesses a strange and awful interest, as a memorial of the rude early conflicts of paganism with the rising Christian creed. It is no other than a pagan caricature of the Christian worship of the Lord on the cross, and contains a Greek inscription descriptive of one Alexamenus as engaged in worshipping his God. The chamber in which it was found appears to have been a waiting-room for slaves and others of inferior grade. The graffiti of the catacombs are almost all sepulchral, and are full of interest as illustrating early Christian life and doctrine.

GRAFT, n. *grăft* [OF. *graffe*, a sort of pen or pencil: F. *greffe*, a slip or shoot for grafting: Dut. *greffie*, a cutting for grafting or planting in the ground, a style for writing—from L. *graphĭŭm*, a pointed instrument for writing on waxen tablets]: a small shoot or scion cut from one tree and inserted into a part of another: V. to insert a cutting of one tree into a part of another in

such a way that they unite; to insert anything into a body to which it did not originally belong. GRAFT'ING, imp.; N. the act or art of inserting grafts or scions. In *slang*, n. plunder, or any commission or allowance, obtained secretly and dishonestly. GRAFT'ED, pp.: ADJ. inserted on a foreign stock. GRAFT'ER, n. one who.

GRAFTING: in horticulture, a method of propagating specific varieties of fruits or plants. It consists in placing in contact portions of two different plants, or different parts of the same plant, in such a way that organic union shall be secured. It can be successfully performed on fruit and timber trees, and on herbaceous plants; but in practice is almost confined to the propagation of choice varieties of fruit. Grafting has been in extensive use from very early times. The ancient Romans were familiar with 20 different methods. It is attended with little difficulty, and, under favorable circumstances, if well done is very likely to prove successful. Budding (q.v.) accomplishes the same purpose by affixing a bud from one plant upon the stem or branch of another, but it is not applicable to so large trees as grafting, and in many other cases is not as desirable a method of propagation.

Fruit-trees can be easily and rapidly multiplied by planting the seeds, but this method does not insure the perpetuation of the specific variety, as seedlings are almost invariably unlike the parent stock. It requires 10 to 20 years for seedlings to come into bearing, but shoots therefrom grafted into large trees produce fruit in three to five years. In nursery grounds (see NURSERY) seeds are planted in rows. When one or two years old the shoots are either grafted or budded. Thus the grower can secure as many trees as he wants of any particular kind, and is enabled to tell in advance what variety of fruit each tree will produce. By placing the weaker and more delicate varieties on vigorous stocks a greater degree of hardiness is secured. Grafting is useful also when it is desirable to change and improve the variety of fruit produced by trees which have come into bearing.

While grafting can be made successful on a large variety of trees and plants it is necessary that the stock (the tree or plant to be grafted), and the scion (portion of the tree or plant that is to be combined with the stock), should belong to the same natural order. The more closely they are related the more readily the desired union is effected. The apple grafted on the apple is entirely successful, while on the pear the apple scion makes only a weak growth. The cherry grafted on the plum is short-lived and practically useless, but each may be successfully grafted on its own kind. In order to secure dwarfed fruit-trees the scions are placed in naturally small and slow-growing trees. The apple is dwarfed by being worked on the Paradise stock and

the pear, of which some choice varieties thrive better as dwarfs than as standards, by being placed on the quince.

About 100 different methods of grafting, each of which is fairly successful, are known; but only a very few are in common use. The principle is the same in all. Whatever method is adopted, it is essential to success that the parts be joined in such a manner that the space between the inner bark and wood of each shall exactly meet and form an unobstructed avenue for the circulation of the sap of the stock through the scion.

Whip grafting is probably the method most extensively employed. It is, practically, a splice of the scion upon the stock, and by offering a comparatively large surface of contact is well adapted for use on small stocks and roots. By an upward sloping cut the stock is taken off near the ground. A slit is then made, about one-third

Fig. 1.—Cleft-grafting.

the way down the slope from the top, in order to form a kind of tongue or shoulder to support the scion. The lower end of the scion is then sloped to fit the stock, a slit is made to match the one which it is to meet, the cut surfaces are pressed together so that, on one side at least, the inner bark of each just meets and the tongues formed by the slits join each other. A strip of cloth is wound closely around the junction, and thoroughly covered with grafting-wax formed of rosin, tallow, and beeswax, in equal proportions, melted together and worked until the mass becomes tough and pliable. The covering is necessary in order to exclude air and moisture, prevent the drying of the scion and the loss of sap from the stock. After the wound has healed, the cloth should be loosened. When the stock and scion are of exactly the same size the slit is often omitted. This is called splice-grafting, and in other respects is performed the same as the preceding. In saddle grafting the end of the stock is cut in the form of a wedge and

the scion in a reverse manner. Cleft grafting is the best method for large trees. Branches from one to three inches in diameter are cut off with a fine-toothed saw. The end of the stock is pared smooth, split with a grafting-knife, and the sides are held apart by a wedge on the back of the knife, which is driven into the cleft. The scion, sharpened like a wedge, about an inch and a half from the lower end, and a little thicker on the side having the lowest bud, and which is to be placed outward, is inserted in the cleft so that the inner bark of stock and scion meet. The wedge is removed, and the end and sides of the stock to a point below the cleft are heavily covered with wax. Two scions are usually placed in each cleft but if both grow one is removed after the first season. In this way the variety of fruit produced by a mature tree can be quickly changed, but as it involves severe pruning it is best to graft only part of it in one season. In root grafting the roots of small trees are cut into pieces three or four inches long, and scions affixed either by the whip, splice, or saddle method, and held in place by paper which has been heavily coated with grafting-wax. The roots are then planted in boxes of fine earth, all but the upper buds of the scions being covered. When the plants are united the plants may be set in the garden or field.

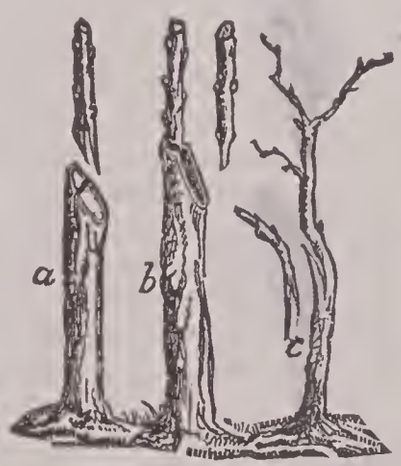


Fig. 2.

a, tongue-grafting; *b*, cleft-grafting; *c*, tongue-grafting (*side-grafting*) as practiced in wall trees to fill up vacancies without cutting over the head of the stock.

Fig. 3.—Shoulder-grafting.

In cold regions scions should be cut in the autumn, packed in moist earth, placed in a dark cellar, and protected from mice. Straight and thrifty shoots should be taken from the centre or top of young and vigorous trees, tied in packages, and properly labelled with the name of the variety. When wanted for use they are cut into pieces three or four inches long, each piece having from two to five buds. Mature wood of the previous season's growth is usually taken, but wood two years old is sometimes preferred. If not cut until spring, scions must be taken from the tree before the buds begin

to swell. In cutting and fitting the scions and stocks, sharp and thin-bladed knives and fine-toothed saws should be used. The plum and cherry must be grafted very early in the spring. The apple and pear thrive better when the weather is mild, and may be grafted until the leaves are put out, but the scions must be kept dormant until used.

GRAFTON, Mass., town in Worcester County; on the New York, N. H. & H., and the Boston & A. R.R's; about 6 miles southeast of Worcester and 9 miles northwest of Milford. In 1728 the first permanent white settlement was made, and the town was incorporated in 1735. As early as 1660 John Eliot (q.v.) established here a settlement of Indians whom he had converted. The manufactures are cotton goods, threads, boxes, boots and shoes, emery, and underclothing. Pop. (1910) 5,705.

GRAFTON, N. Dak., city, county-seat of Walsh County; on the Park River, the Great N., and the Northern P. R.R.'s; 15 miles w. of the Red River of the North. It is in the great wheat region, and is the trade centre of Walsh County. It has grain elevators, flour-mills, and cattle-yards, and manufactures farming implements. It is the seat of the State Institute for the Feebleminded. Pop. 3,000.

GRAFTON, W. Va., city and county-seat of Taylor County, located in the northern part of the state, 100 m. s.e. of Wheeling, and on the Tygart Valley River, and the Baltimore & O. R.R. The city is the terminus of four branches of the Baltimore and O. R.R., and owes its importance to the establishment of the Baltimore & O. R.R. machine shops. It also has flour and planing mills, a wooden pump factory, foundries, cigar and glass factories, and is also engaged in mining and agriculture. There are eight churches, public and parochial schools, and five banks, with a combined capital of $310,000, and there are two weekly papers published. A national cemetery is within the city limits containing 1261 graves, 600 of which are nameless. Municipal affairs are administered by a mayor and council of eight members, elected for two years. The city owns its waterworks and electric lighting plant. It was founded in 1854, incorporated in 1856, and received its charter as a city in 1899. The population is mainly English and German. Pop. (1910) 7,563.

GRAGNANO, *grän-yä'no:* town of Italy, province of Naples, two m. s.e. of Castellamare; on the flank of Mount Gaurano, from which it is said to have derived its name. The origin of this town dates from the great eruption of Vesuvius A.D. 79, when the inhabitants of Stabia, in dread of the vicinity of the volcano, fled from their dwellings and sought refuge on the mountain of Gaurano. Gragnano lies in a beautifully picturesque

neighborhood, which produces excellent wines, and has good macaroni manufactories. Pop. about 8,000.

GRAHAM, *grā'am*, CHARLES KINNAIRD: civil engineer: 1824, June 3—1889, April 15; b. New York. He was appointed midshipman in the U. S. navy 1841, served with the fleet during the Mexican war; resigned and began studying engineering in New York 1848, and was appointed constructing engineer at the Brooklyn navy yard 1857. At the beginning of the civil war he entered the army, become col. of the Excelsior brigade, brig.gen. 1862, Nov., was severely wounded at Gettysburg, commanded a gun-boat flotilla on the James river, took part in the assault on Fort Fisher, and was brevetted maj.gen. of vols. 1865, Mar. 13. Returning to New York he resumed engineering, was chief engineer of the dept. of docks 1873-75, surveyor of the port 1878-83, and naval officer 1883-5.

GRAHAM, FAMILY OF. See MONTROSE.

GRAHAM, ISABELLA: 1742, July 29—1814, July 27; b. Lanarkshire, Scotland: philanthropist: she was a daughter of John Marshall, received a thorough education, founded the Penny Soc., afterwards the Soc. for the Relief of the Destitute Sick; married John Graham, M.D., of Paisley, and went with him and his regt. to Canada. After serving there 4 years Dr. Graham was ordered to Antigua, where he died 1774. His widow returned to Scotland, but removed to New York 1789, and devoted herself to philanthropic labors. She established societies for the relief of widows and orphans and the promotion of industry, aided in organizing in New York the Magdalen Soc., the first missionary soc., the first Sunday school for adults, and the first missionary prayer-meeting, and was the first who sympathetically visited sick women in the hospitals and prisons and distributed Bibles and tracts among the sick, poor, and ignorant.

GRAHAM, JAMES DUNCAN, American topographical engineer: b. Prince William County, Va., 1799, April 4; d. Boston 1865, Dec. 28. Graduated from the United States Military Academy in 1817, he entered the corps of topographical engineers, in which he attained major's rank in 1838, was astronomer to the survey which determined the boundary line between the United States and the republic of Texas (1839-40), and later United States astronomer in the joint survey of the boundary between the United States and the British provinces. In the determination also of the boundary between the United States and Mexico he held a similar post. Subsequently he directed harbor improvements in the lakes of the North and Northwest, in which he was the first to detect the presence of a lunar tide, and was superintending engineer of the Boston harbor sea-walls and

of repairs in various harbor-works along the Atlantic coast.

GRAHAM, Sir JAMES ROBERT GEORGE, The Right Honorable, of Netherby, Cumberland, England: statesman: 1792, June 1—1861, Oct. 25; eldest son of Sir James, the first baronet, by Lady C. Stewart, eldest daughter of the seventh Earl of Galloway. Graham was educated at Westminster School, and at Queen's College, Cambridge. He was private sec. to Lord Montgomerie, British minister in Sicily; and then at the same post, with Lord William Bentinck, and continued in a military position with the latter, who became commander-in-chief in the Mediterranean. In this capacity he negotiated with Murat at Naples, the armistice which separated that general from Napoleon. 1818-20 he was returned to parliament for Hull on whig principles; 1824, he succeeded to the baronetcy on the death of his father; 1826, he was returned for Carlisle as a whig, and a warm supporter of Rom. Cath. emancipation; 1830, Earl Grey offered him the post of first lord of the admiralty, with a seat in the cabinet. At this time he was very popular with the extreme liberal party. In 1834, he seceded from the govt., and though refusing to join the Peel administration in that year, gradually approximated to Peel's politics; and in 1841 became sec. of the state for the home dept. under Sir Robert Peel, who declared that Graham was the ablest administrator that he had ever known. In 1844 he incurred great obloquy by issuing a warrant for opening the letters of Mazzini, and communicating information thus obtained to the Austrian minister. He also roused great displeasure n. of the Tweed by his high-handed dealing with the Scottish Church during the troubles which ended in the disruption, and the formation of the Free Church. He gave Peel warm support in carrying the Corn-law Repeal Bill, and resigned office with his chief as soon as that great measure was carried. At the death of Peel 1850, he became leader of the Peelite party in the lower house, and led the opposition to the Ecclesiastical Titles Bill. 1852-55 he was in the coalition ministry of the Earl of Aberdeen, in his old office of first lord of the admiralty. Graham had fine personal presence, and a calm and impressive delivery in debate; but was accused of political fickleness, having been whig in youth, conservative in middle life, and radical in old age.

GRAHAM, JOHN (Viscount DUNDEE): 1643-89; eldest son of Sir William Graham of Claverhouse, head of a branch of the noble family of Montrose, in Forfarshire, Scotland. He entered St. Andrews Univ. 1665, served in the French army 1668-72, and entered the Dutch service as cornet in the Prince of Orange's horse guards.

Returning to Scotland, he obtained (1678, Feb.) an appointment as lieut. in a troop of horse commanded by his cousin, third Marquis of Montrose. At this time the govt. of Charles II. was engaged in its wild attempt to force episcopacy upon the people of Scotland. A system of fines and military coercion had been carried on for years against all Nonconformists; conventicles and field-preachings were prohibited, penalties were inflicted on all who even harbored the recusants, and the nation lay at the mercy of informers. Maddened by oppression, and fired by a fierce zeal for the Covenant, the people flew to arms; but their efforts were irregular and detached, and each successive failure aggravated their sufferings. Many were put to death, the jails were filled with captives, and those who fled were outlawed, and their property seized. In this miserable service Graham engaged. He encountered an armed body of Covenanters at Drumclog, 1679, June 1, but was defeated, and fled from the field. Three weeks afterward he commanded the cavalry at Bothwell Bridge, where the royal forces, under the Duke of Monmouth, achieved an easy victory over the Covenanters. In this battle three or four were killed while defending the bridge, but in the pursuit 400 were cut down (chiefly by Graham's dragoons), and 1,200 surrendered unconditionally, to be afterward treated with atrocious inhumanity. These affairs at Drumclog and Bothwell were the only contests that can even by courtesy be called battles in which Graham was engaged in Scotland previous to the abdication of James II. They gave no scope for valor, and displayed no generalship. In his other duties—pursuing, detecting, and hunting down unyielding Covenanters—Graham evinced the utmost zeal. He rose to the rank of maj.gen., was sworn a privy councilor, had a gift from the crown of the estate of Dudhope, and was made constable of Dundee. In 1688, on the eve of the Revolution, he was raised to the peerage by James II. as Viscount Dundee and Lord Graham of Claverhouse. When the bigotry of James had driven him from the throne, Dundee remained faithful to the interests of the fallen monarch. He was joined by the Jacobite highland clans and by auxiliaries from Ireland, and raised the standard of rebellion against the governments of William and Mary. After various movements in the north, he advanced on Blair in Athol, and Gen. Mackay, commanding the govt. forces, hastened to meet him. The two armies confronted each other at the Pass of Killiecrankie, 1689, July 27. Mackay's force was about 4,000 men; Dundee's 2,500 foot, with one troop of horse. A few minutes decided the contest. After both armies had exchanged fire, the Highlanders rushed on with their swords, and the enemy instantly scattered and gave way. Mackay lost by death and capture 2,000 men,

the victors 900. Dundee fell by a musket-shot while waving on one of his battalions to advance. He was carried off the field to Urrard House, or Blair Castle, and there died. See *Memorials and Letters illustrative of the Life and Times of John Graham of Claverhouse*, by Mark Napier (1862).

GRAHAM, JOHN HODGES: 1794, Mar. 9—1878, Mar. 15; b. Vt.: U. S. naval officer. He was appointed midshipman in the navy 1812, June 18, was commissioned lieut. 1817, Mar. 5, promoted capt. 1849, Mar. 7, retired 1855, and promoted commodore on the retired list 1867, Apr. 4. He took part in a notable expedition against a strong British post opposite Black Rock, N. Y., in the war of 1812, and was commander of McDonough's flagship in the battle of Lake Champlain.

GRAHAM, SYLVESTER: 1794—1851, Sep. 11; b. Suffield, Conn.: reformer. He spent several years teaching; entered Amherst College to prepare for the ministry 1823, but did not complete the course; was ordained a Presb. clergyman 1826, and began his temperance and dietetic reform work 1830. He conceived the great panacea for intemperance to be a purely vegetable diet, and the remainder of his life was spent in writing and lecturing on that theory, which he subsequently elaborated till it was made to apply to all forms of disease. He introduced *Graham Bread*, made from unbolted wheat flour.

GRAHAM, THOMAS: celebrated chemist: 1804, Dec. 21—1869, Sep. 16; b. Glasgow. Having studied at Glasgow and Edinburgh, he became, in 1830, prof. of chemistry at the Andersonian Univ., and continued in that office till 1837, when he succeeded Dr. Turner in the chemical chair of University College, London. In 1855, he was appointed master of the mint, and resigned his professorship. From 1831, in which his memoir, 'On the Formation of Alcoates, Definite Compounds of Salts and Alcohol,' appeared in *Transactions of the Royal Soc. of Edinburgh*, till his death, he was constantly publishing important contributions to chemistry. Among the most important are: 'On the Law of Diffusion of Gases' (*Tr. R. Soc. Edin.* 1834); 'Researches on the Arseniates, Phosphates, and Modifications of Phosphoric Acid' (*Phil. Tr.* 1833); 'On the Motion of Gases, their Effusion and Transpiration' (*Ibid.* 1846,49); 'On the Diffusion of Liquids' (*Ibid.* 1850,1); 'On Osmotic Force' (*Ibid.* 1854); 'Liquid Diffusion Applied to Analysis,' and 'On Liquid Transpiration in Relation to Chemical Composition' (*Ibid.* 1861). In addition to these memoirs, he brought out an excellent treatise on chemistry. Graham was one of the founders and first president of the Chemical and the Cavendish Societies, was a fellow of the Royal Soc. and was frequently placed by government on important scientific commissions.

Graham was remarkably persistent, original, and successful in his study of the laws of atomic motion, and of the molecular mobility of gases. He originated the now well-known 'Graham's law'—*that the diffusion of gases is inversely as the square root of their density*—an important principle now seen to be included under fundamental law of motion.

GRAHAME, *grā'am*, JAMES: Scottish poet: 1765, Apr. 22—1811, Sep. 14; b. Glasgow; son of a legal practitioner. He was educated at the Univ. of Glasgow. He removed to Edinburgh 1784, studied law, and was admitted to the Faculty of Advocates 1795; but soon withdrew from professional practice and applied himself to poetry. He took orders in the Church of England 1809, May 28; and was successively curate of Shipton, Gloucestershire, and of Sedgefield, Durham. Ill health compelled him to retire from his duties, and he returned to Scotland, and died near Glasgow. Grahame left several poetical works, the chief of which are—*Mary Queen of Scots*, dramatic poem; *The Sabbath; The Birds of Scotland;* and *The British Georgics*. It is on *The Sabbath* that his fame rests. He was retiring, amiable, and affectionate, with deep love for nature, and without bold or mounting genius.

GRA'HAME'S (or HO'THAM'S) ISL'AND: a mass of dust, sand and scoriæ thrown out of a submarine volcano in the Mediterranean, and which remained for some time above the surface of the water. It made its appearance about 30 m. off the coast of Sicily, opposite to Sciacca, 1831, July. In the beginning of Aug., when the action of the volcano had ceased, it had a circumference of about a mile and a quarter, the highest point was estimated at 170 ft. above the sea, and the inner diameter of the crater about 400 yards. As soon as the eruption ceased, the action of the waves began to reduce the island, and in a few months the whole mass disappeared, being scattered as a stratum of volcanic cinder in that portion of the bed of the Mediterranean.

GRAHAM'S LAND: island of the Antarctic Ocean, discovered by Biscoe 1832, Feb.; lat 64° 45′ s., and long. 63° 51′ w., nearly on the meridian of the e. extremity of Tierra del Fuego, and not far from the polar circle. The position, as above defined, is precisely that of Mt. William, the highest spot seen. In front, toward the north, are a number of islets, called Biscoe's Range. No living thing appears, except a few birds.

GRAHAM'S TOWN: capital of the e. province of the Cape Colony, s. Africa; near the centre of the maritime division of Albany. It is about 116 m. from Port Elizabeth, with which it is connected by rail, and 25 m. from the sea; 1,760 ft. above sea-level. Graham's Town is the see of two bishops—one of the Church of England,

the other of the Church of Rome, and possesses an English cathedral. It has also several churches of various denominations. There are banks, insurance offices, a botanic garden, a public library, a general hospital, large barracks, and two newspapers. Pop. about 10,000.

GRAIL, n. *grāl*, or GRADUAL, n. *grăd'ū-ăl* [mid. L. *grădālĕ*; It. *graduale*, gradual—from L. *grădus*, a step]: a book of anthems or sentences of Scripture used in the worship of the Rom. Cath. Chh.—so named because originally read from the steps of the 'ambo,' a kind of pulpit.

GRAIL, n. *grāl* [F. *grêle*, slender—from OF. *graile*, fine, small—from It. *gracile*—from L. *grăcĭlĭs*, slender]: in *OE.*, fine sand; gravel.

GRAIL (THE HOLY), or GRAAL, or GREAL, or GRAL, or GRAYLE. n. *grāl* [OF. *graal*, a flat dish: mid. L. *gradāle*, a flat dish, a vase (see SANGREAL)]: legendary sacred dish. In the legends and poetry of the middle ages, we find accounts of the Holy Graal—San Gréal—a miraculous chalice, made of a single precious stone, sometimes said to be an emerald, which possessed the power of preserving chastity, prolonging life, and other wonderful properties. The legend was, that this chalice was brought from heaven by angels, and was the one from which Christ drank at the Last Supper. It was preserved by Joseph of Arimathea, and in it were caught the last drops of the blood of Christ as he was taken from the cross. This chalice, thus trebly holy, was guarded by angels, and then by the Templises, a society of knights chosen for their chastity and devotion, who watched over it in a temple-like castle on the inaccessible mountain Montsalvage. The legend, as it grew, appears to have combined Arabian, Jewish, and Christian elements, and it became the favorite subject of the poets and romancers of the middle ages. The eight centuries of warfare between the Christians and Moors in Spain, and the foundation of the order of Knights Templars, aided in its development. The stories and poems of Arthur and the Round Table were connected with this legend. About 1170, Chrétien of Troyes, and after him other troubadours sang of the search for the Holy Grail by the knights of the Round Table, in which they met with many extraordinary adventures. Some have supposed that the story of the connection of the miraculous chalice with the Last Supper and the blood of Christ arose from a wrong division of the words *san gréal*, holy vessel, which were written *sang réal*, royal blood, blood of the Lord (royal, though not as some have thought real or true blood): the coincidence is certainly curious, but the inference is very dubious. The legend of the Grail was introduced into German poetry in the 13th c., by Wolfram von Eschenbach, who took

Guiot's tales of Parcival and Titurel as the foundation of his poem, but filled it with deep allegorical meanings. Tennyson's *Holy Grail* has recently made the legend familiar to English readers. Consult Baring-Gould, *Curious Myths of the Middle Ages;* Birch-Hirschfeld, *Die Sage vom Gral;* Furnival, *La Queste del Saint Graal;* Gurteen, *The Arthurian Epic* (1895); Hucher, *Le Saint Graal* (Paris 1875-9); Heinzel, *Ueber die französischen Gral-romane* (Vienna 1891); Nutt, *Studies on the Legend of the Holy Grail;* Rhys, *Studies in the Arthurian Legend;* Paris (G.) *La litterature Française au moyen age* (2d ed. Paris 1890).

GRAIN, n. *grān* [F. *grain*—from L. *granum;* It. *grano,* grain, corn: L. *granŭlĕ,* a little grain]: any small hard mass; a single seed; corn in general; i.e., the seeds of the *Cerealia;* in the United States a common appellation of wheat, often classed in Britain as corn; any minute particle; the smallest weight, so named because supposed of equal weight with a grain of corn (American wheat); the unit of the English system of weights, there being 5,760 in a Troy lb., and 7,000 in a lb. avoirdupois. V. to form into grains, as powder. GRAINED, a. *grānd,* formed into grains; roughened. GRAIN-DEALER, one who deals in corn. GRAIN-TIN, tin melted with charcoal; the tin reduced from the melted grains of tin-stone. GRANARY, n. *grăn'ă-rĭ,* a building for storing grain. GRANIF'EROUS, a. *-ĭf'ĕr-ŭs* [L. *fero,* I carry]: bearing hard seeds or grain. GRAN'IFORM, a. *-ĭ-fawrm* [L. *forma,* shape]: resembling grains of corn. GRANIV'OROUS, a. *-ŏ-rŭs* [L. *voro,* I devour]: grain-eating. GRANULAR, a. *grăn'ū-lėr,* consisting of grains; resembling grains. GRAN'ULARLY, ad. *-lĭ.* GRAN'ULATE, v. *lāt,* to form into grains or very small pieces; to make rough on the surface; to repair lost parts, as a wound in healing. GRAN'ULATING, imp. GRAN'ULATED, pp. GRAN'ULA'TION, n. *-lā'shŭn* [F.—L.]: the act of forming into grains; the art of forming metals into grains by pouring them, when melted, from a height into water; small fleshy excrescences springing up on the surface of wounds in the process of healing. GRAN'ULE, n. *-ūl,* a little grain. GRAN'ULOSE, n. *-ū-lōs,* the more soluble portion of the starch grains in plants. GRAN'ULOUS, a. *-lŭs,* full of granules.

GRAIN, v. *grān* [OE. *grain,* the kermes, an insect found on certain oaks, from which the finest red dyes were formerly obtained: F. *graine,* seed, the kermes: It. *grana,* the redness upon the surface of some work: Sp. *grana,* seed, the cochineal dye, the cloth dyed with it]: to paint or ornament in imitation of wood; GRAIN'ING, imp.: N. a mode of painting in imitation of the grains of wood; a process of staining. GRAINED, pp. *grānd.* GRAIN'ER n. *-ėr,* one who paints in imitation

of the grain of wood; the brush with which he works; an infusion of pigeon's dung in water, used for giving flexibility to skins in the process of tanning. GRAIN COLORS, dyes made from cochineal.

GRAIN, n. *grān* [Icel. *gren*, a branch: Dan. *green*, a branch, a bough]: direction of the fibres of wood; the wood as modified by the fibres; the form or direction of the constituent particles of a body; the temper or disposition. GRAINS, n. plu. *grānz*, an instrument with barbed prongs, used at sea for spearing fish. AGAINST THE GRAIN, against the direction of the fibres. CROSS-GRAINED, across the natural fibre, and so difficult to plane; ill-tempered. To GO AGAINST THE GRAIN, to be repugnant to; to cause trouble or mortification to. To DYE IN GRAIN, to dye in the raw material; to dye firmly. THE GRAIN-SIDE OF LEATHER, that side of the tanned or dressed hide on which the hair grew.

GRAIN COAST. See GUINEA.

GRAINES D'AVIGNON. See FRENCH BERRIES.

GRAINING (*Leuciscus Lancastriensis*): fish of the family *Cyprinidæ*, of the same genus with the Dace (q.v.) which it much resembles. It was pointed out as a different species first by Pennant, who found it in the Mersey, England. It is rather more slender than the dace. In its habits and food it resembles the trout, rises readily at the artificial fly, and affords good sport to the angler.

GRAINS, n. plu. *grānz* [a corruption of Eng. *drains*: Russ. *dran*, refuse: Dut. *drank*, drees: Sw. *dragg*, grains (see DRAINS)]: the refuse or husks from malt or grain after brewing or distillation; also called DRAFF.

GRAINS OF PAR'ADISE, or MELEGUETTA PEPPER *mĕl-ĕ-gwĕt'ta pĕp'ĕr:* aromatic and extremely hot and pungent seed imported from Guinea. It is the produce of *Amomum Meleguetta*, or *A. Grana Paradisi*, plant of nat. ord. *Scitamineæ* or *Zingiberaceæ*, with lanceolate leaves, one-flowered scapes (leafless stems), about 3 ft. high, and ovate or elliptic-oblong capsules containing many seeds. By the natives of Africa, these seeds are used as a spice or condiment to season their food; in Europe, they are employed chiefly as a medicine in veterinary practice, and fraudulently to increase the pungency of fermented and spirituous liquors. By law, brewers and dealers in beer are prohibited under heavy penalty from even having grains of paradise in their possession. This drug is much used to give apparent strength to bad gin. The name Meleguetta pepper, or Guinea pepper (q.v.), is given to other pungent seeds from w. Africa.

GRAIP, n. *grāp* [old Sw. *grepe*, a dung-fork]: in *Scot.*, a dung-fork; a forked instrument for lifting potatoes, etc.

GRAITH, n. *grāth* [Icel. *greithi*, equipment, arrangement; *greitha*, to equip; *greithr*, ready: Ger. *geräth*, utensils, luggage]: in *Scot.*, furniture; accoutrements; the working tools of a miner; any materials employed by mechanics and others in preparing their work; soapsuds for washing clothes.

GRAKLE, or GRACKLE, *grăk'l:* common name of many birds of the starling family (*Sturnidæ*), all tropical or sub-tropical. They have very much the habits of starlings, and some of them even excel starlings in their imitative powers, particularly in the imitation of human speech. This is remarkably the case with the Mina birds (q.v.), of the E. Indies, which may be regarded as grakles. Numerous species inhabit Africa. Some are birds of splendid plumage. The PARADISE GRAKLE (*Gracula gryllivora*) of India has acquired a peculiar celebrity as a destroyer of locusts and caterpillars. It is about the size of a blackbird. Buffon tells us, that in order to stop the devastations of locusts in the island of Bourbon, this bird was introduced from India by the government. The grakles, however, beginning to examine the newly-sown fields, excited the alarm of the planters, and were exterminated; but it was found necessary, after a few years, again to introduce them, and they are now very numerous, though they do not confine themselves to insect food, but in default of it eat seeds and fruits. They sometimes enter pigeon-houses and feed on the eggs, or even on the newly-hatched young. When tamed, they become very pert and familiar, and exhibit a great aptitude for imitating the voices of animals. A grakle of this species, kept in a farmyard, has been known to imitate most of its ordinary sounds, as those of dogs, sheep, pigs, and poultry. Some of the grakles are known as summer birds of passage in the northern parts of America.

GRALLÆ, n. plu. *grăl'lē*, also GRALLATORES, n. plu. *grăl'lă-tō-rēz* [L. *grallator*, he that goes on stilts; *grallæ*, stilts—from *grădus*, a step]: stilted or long-legged wading birds, such as the stork or crane. GRAL'LATORY, a. *-tėr-ĭ*, of or pertaining to; also GRAL'LATO'RIAL, a. *-tō'rĭ-ăl*. The *Grallatores* are an order of birds, generally characterized by very long legs, the *tarsus* (shank) in particular being much elongated, and by the nakedness of the lower parts of the tibia, adapting them for wading in water without wetting their feathers. They have also generally long necks and long bills. The form of the bill, however, is various: and in its size, strength, and hardness, it is adapted to the variety of food; some, as snipes, which feed chiefly on worms and other soft animals, having a very soft weak bill, while others, which feed on larger and stronger animals, have the bill proportionately large and strong. The

form of the body is generally slender. The greater number of the grallæ are inhabitants of the sea-coast or of marshy districts. Many are birds of passage. Even those which are not aquatic are generally driven from the districts which they frequent either by frost or drought. Cuvier divided this order into *Brevipennes* (q.v.), (Ostrich, Cassowary, Emu, etc.); *Pressirostres* (Bustards, Plovers, Lapwings, etc.); *Cultrirostres* Cranes, Herons, Storks, Adjutants, Spoonbills, etc.); *Longirostres* (Snipes, Curlews, Godwits, Sandpipers, etc.); and *Maerodactyli* (Rails, Crakes, Coots, etc.). The *Brevipennes* are constituted by some into a distinct order, *Cursores*, and differ very widely in many respects from the true grallæ.

GRAM, n. *grăm* [Icel. *gramr*, wrath]: in *OE.*, angry; wrathful.

GRAM, n. *grăm:* name by which the chick-pea is known in the East, used as a food when roasted. See CHICK-PEA.

GRAM, or GRAMME [see GRAMME]: standard unit of French measures of weight; the weight of a cubic centimètre of distilled water at 0° centigrade (corresponding to 32° Fah.): the other weights have received names corresponding to the number of grammes that they contain, or the number of times that they are contained in a gramme: in the former case, the Greek numerals, deca, hecto, kilo, myria, expressing weights of 10 grammes, 100 grammes, 1,000 grammes, 10,000 grammes; in the latter case, the Roman numerals, deci, centi, are prefixed, to express tenths, hundredths of a gramme. Starting from the relation between the English yard and the French mètre, we are enabled to compare the units of weight, and it is found that a gramme = 15·432348 grains Troy, from which the equivalents in English measure for the other weights can easily be found: thus—

	Grains Troy.		Lbs. Avoirdupois.		
Centigramme =	·1543234	=	·0000220462		
Decigramme =	1·543234	=	·000220462		
GRAMME =	15·43234	=	·00220462		
Decagramme =	154·3234	=	·0220462		
Hectogramme =	1543·234	=	·220462		
Kilogramme =	15432·34	=	2·20462		
Myriagramme =	154323·4	=	22·0462	=	·19684 cwt.
Quintal (q.v.) =	1543233	=	220·462	=	1·9684 "

GRAMERCY, n. *grā-mėr'sĭ* [F. *grand*, great; *merci*, thanks]: in *OE.*, great thanks, an expression of thanks for an obligation.

GRAMINEAL, a. *grā-mĭn'ē-ăl*, or GRAMIN'EOUS, a. *-ē-ŭs*, and GRAM'INA'CEOUS, a. *-ā'shŭs* [L. *gramĭnĕŭs*, pertaining to grass—from *grāmĕn*, *grass*: F. *graminée*]: grassy; like grass; pertaining to grass. GRAMINEÆ, n. plu. *grā-mĭn'ē-ē*, or GRAMINACEÆ, *grăm'ĭn-ā'sĭ-ē*, a very

extensive and important order of plants called grasses (see GRASSES). GRAMIN'IFO'LIOUS, a. *-ĭ-fō'lĭ-ŭs* [L. *fŏlĭŭm*, a leaf]: bearing leaves like grass. GRAM'INIV'OROUS, a. *-ĭv'ō-rus* [L. *voro*, I devour]: feeding on grass.

GRAMMAPHENY. See HANDWRITING, STUDY OF.

GRAMMAR, n. *grăm'mėr* [F. *grammaire*—from mid. L. *grammārĭa*—from Gr. *gramma*, a letter]: the science which treats of the principles of language; the art of speaking, reading, or writing any language with correctness according to established usage, the book containing the rules and principles relating to a language; propriety of speech; speech according to grammar; ADJ. pertaining to. GRAMMA'RIAN, n. *-mā'rĭ-ăn*, one versed or skilled in the grammar of language. GRAMMAT'ICAL, a. *-măt'ĭ-kăl*, or GRAMMAT'IC, a. *-ĭk* [L. *grammat'ĭcus*—from Gr. *grammat'ĭkŏs*]: according to the rules of grammar: belonging to grammar. GRAMMAT'ICALLY, ad. *-lĭ*. GRAMMAT'ICALNESS, n. the quality of being according to the rules of grammar. GRAMMAT'ICIZE, v. *-sīz*, to render grammatical; to act the grammarian. GRAMMAT'ICIZING, *imp.* GRAMMAT'ICIZED, pp. *sīzd*.

GRAM'MAR, in its usual sense, and as applied to a particular language: investigation and systematizing of the facts of a language, as exhibited in the most approved writers and speakers; the main divisions or heads being: (1) the way in which the sounds or spoken words are represented by letters (Orthography); (2) the division of words into classes, or 'parts of speech,' the changes or inflections that they undergo, their derivation and composition (Etymology); (3) the way in which they are joined together to form sentences (Syntax). A book embodying the results of such investigations, with a view to enable learners to understand a language, and to use it properly, is a grammar of that language.

Languages were not originally constructed according to rules of grammar previously laid down; but grammar rules were deduced from languages already in existence. In the days of Plato, perhaps the greatest master of language that ever wrote, the division of words into classes or parts of speech had not yet been made. Plato himself, according to Max Müller, took the first step in formal grammar by making the distinction of noun and verb, or rather of subject and predicate; for it was a distinction in the ideas or elements of a proposition which he was making, rather than in the words themselves. Aristotle and the Stoic philosophers made further advances in the analysis of language, but they attended little to the forms of words, their object being logical rather than grammatical (see GENITIVE). It was the Alexandrian scholars, engaged in preparing

critical editions of Homer and the other Greek classics, who first analyzed, classified, and named the phenomena of language as language; and it was one Dionysius Thrax, who had been trained in the Alexandrian school and became a teacher of Greek (*Grammaticus*, from Gr. *gramma*, a letter; as those who taught boys their Roman letters were called *Literatores*) at Rome, that published the first practical systematic Greek grammar for the use of his Roman pupils (about B.C. 80). This work, which still exists, though much interpolated, became the basis of all subsequent grammars, both Greek and Latin; and when grammars of the modern European tongues came to be written, they naturally followed the classical models. For the chief matters treated of in grammar, see such heads as ADJECTIVE; CONJUNCTION; DECLENSION, etc.

In quite recent times, the study of language has advanced beyond this empirical stage, in which its object was confined to the explaining and teaching individual languages; and, under the name of 'Comparative Grammar,' has brought to light the resemblances and differences of the various languages of the world, so as to classify them, after the manner of natural history, into families and minor groups, according to their greater or less affinities. Still higher questions, entering into the origin and growth of speech, and seeking to give a scientific account of its phenomena, now occupy the more advanced students of this subject. See LANGUAGE; INFLECTION.

GRAMMAR SCHOOL: originally a school giving prominence to Latin and Greek study. Such schools received their name at a time when the grammar of the English language was not written, and when all knowledge of the principles of language could be obtained only through a study of the grammar of the ancient tongues, particularly Latin. In Britain this idea at the basis of these institutions still pervades them, and the ancient languages are principal subjects of instruction. History, geography, science, and modern languages have of late years been admitted into the curriculum of the great majority of these schools; but these subjects still hold a subordinate place, and distinction in Latin and Greek gives pre-eminence, and is the great object of ambition both to masters and to pupils. Nor can it be otherwise so long as the universities recognize the ancient tongues as the only sound basis of a liberal education. See further, EDUCATION; EDUCATION, NATIONAL; PUBLIC SCHOOLS.

GRAMME, or GRAM, n. *grăm* [F.—from Gr. *gramma*, what is written]: French unit of weight equal to 15·432 English grains: see GRAM.

GRAMMONT′ (or GRAMONT), PHILLIBERT, Count of:

French courtier: 1621-1707; son of Anthony, Duke of Grammont. While still very young, he served as a volunteer under Condé and Turenne, and distinguished himself by chivalric bravery. At the court of Louis XIV., with this reputation added to his youth, noble birth, a handsome person, fine talents and accomplishments, a lively wit, and strangely good-fortune at gaming, at which he won such amounts as to support even his extravagant expenditures, he easily became a favorite. He was distinguished for his gallantries, and even had the audacity to aspire to be the rival of the king in the affections of one of his favorites. This caused him to be banished from France; and he found a pleasant refuge and congenial society in the gay and licentious court of Charles II. of England. Here, after many adventures, he engaged to marry Eliza Hamilton, sister of Anthony, Count Hamilton, but slipped out of London without fulfilling his promise. Two of the lady's brothers set off in pursuit of the forgetful Frenchman, and coming up with him at Dover, asked him 'if he had not forgotten something.' 'O, to be sure,' replied Grammont, 'I have forgotten to marry your sister,' and returned to London to complete his engagement. He then went to France, where his wife became one of the ladies of the court of Maria Theresa of Austria. By this marriage he had two daughters, one of whom was married to Henry Howard, Marquis of Stratford, and the other became Abbess of Poussay, in Lorraine. See *Memoirs of the Comte de Grammont* by his brother-in-law, Anthony, Count Hamilton (edited by Sir Walter Scott 1811; reprinted in Bohn's 'extra volumes'). These memoirs, not to be commended for general reading, show the frightful profligacy of the court of Charles II. which followed and explain the stern moral reaction of Puritanism.

GRAMMONTIANS, n. *grăm-mŏn'tĭ-anz* [from *Grandmont*, whither the order moved after Stephen's death]: in *chh. hist.*, monastic order founded at Muret 1073, with the sanction of Pope Gregory VII., by Stephen of Thiers, nobleman of Auvergne, who is sometimes called Stephen de Muret.

GRAMOPHONE, *grăm'ō-fōn* [Gr. *gramma*, a writing; *phonē, voice*]: instrument for producing the same effects produced by the Phonograph (q.v.). It was invented 1890 by Emil Berliner. At an exhibition of the gramophone by its inventor before the Amer. Institute of Electrical Engineers, New York, 1890, Dec. 16, the instrument uttered through its mouthpiece, in tones loud enough to be heard plainly in every part of a large room, songs, piano music, cornet solos, clarinet solos, band music, and organ music. The degrees of clearness varied; and while the gramophone never re-

produced the original sounds with absolute fidelity, it approached perfection very nearly. Instead of a cylinder, as in Edison's phonograph, the gramophone has a zinc disk for receiving the impressions; the disk is covered with a film of wax, through which the recording stylus cuts down to the zinc surface. The lines traced by the stylus are afterward eaten out in the zinc by an acid. The disk is mounted on a vertical spindle, within an etching-trough, which revolves with it. The mouth-tube, diaphragm, and recording stylus are mounted on a carriage moved toward the centre of the disk by a screw taking its motion from the spindle. The disk is revolved rapidly by a wheel, which is turned by a hand-crank. As the disk revolves, sounds that enter the mouthpiece are transmitted to the diaphragm. The vibrations of the diaphragm are imparted to the stylus, and, as the disk revolves, the stylus records in the wax wavy lines that represent the sounds entering the mouthpiece. As the carriage bearing the stylus is slowly moved toward the centre of the disk, the impressions on the wax form a spiral line. When the record is finished, the disk is flooded with the acid. The record being thus completed, a separate machine is used for reproducing the sounds. To the reproducing machine the disk is transferred after all the wax has been removed from its surface. As in the recording instrument, the disk is mounted on a spindle, with which it revolves. The diaphragm carries a stylus, which follows the spiral groove in the disk, and produces in the diaphragm vibrations that correspond to those which the diaphragm of the recording machine received. A great trumpet, at the smaller end of which the diaphragm and reproducing stylus are carried, sends out a remarkable volume of sound. Copies *ad libitum* can be made from the disk.

GRAMPIANS; mountains in Australia, running n. and s. in w. Victoria, in s. lat. 36° 52′—37° 38′ and in e. long. 142° 25′—142° 47′. From their e. slope flow the Glenelg and its affluents. The loftiest peak of the range, Mt. William, is 4,500 ft. above the sea.

GRAMPIANS, *grăm′pĭ-anz:* principal mountain system in Scotland; running from n.e. to s.w., forming the well-known high grounds of Aberdeenshire, Kincardineshire, Forfarshire, and Perthshire. The average elevation of the summits of this main range is from 2,000 to 3,000 ft., and the highest elevation reached is that of Ben Nevis (4,406 ft.) at its w. extremity. An outlying branch of the Grampians extends northward from near the head of the valley of the Dee, and comprises among its chief summits Ben Muicdhui (4,296 ft.) and Cairngorm (4,084 ft.). Southward of the w. extremity of the Grampians are numerous groups and chains of greater or less extent. Among these the chief

summits are Ben Cruachan (3,693 ft.), Ben Lomond (3,192 ft.), Ben More (3,845 ft.), Ben Lawers (3,984 ft., with cairn 4,000), and Schiehallion (3,547 feet).

GRAMPUS, n. *grăm'pŭs* [probable corruption of F. *grand poisson*, It. *gran pesce*, or Sp. *gran pez;* L. *grandis piscis*, great fish]: large species of arctic dolphin; a cetaceous animal, common in the arctic seas, as on the coasts of Greenland and Spitzbergen, not infrequent in the Atlantic. It is one of the *Delphinidæ*, or dolphin family, and is commonly referred by naturalists to the same genus with the porpoise, under the names *Phocæna Orca*, *P. Grampus* and *P. gladiator*, although a new genus, *Grampus*, also has meen proposed for it. It is the largest of the *Delphinidæ*, often more than 20 ft. in length; its form spindle-shaped, but thicker in proportion than the porpoise, from which it differs also in the much greater height of its dorsal fin, in the upper jaw projecting a little over the lower, and in the smaller number of teeth, which are about 11 on each side in each jaw. The tail is powerful; in a specimen 21 ft. long, the tail was 7 ft. broad. The Grampus is generally seen in small herds. It is very voracious, and pursues salmon up the mouths of rivers as far as the tide reaches. Marvellous stories are told of attacks which it makes on the whale, and of its tearing and devouring the whale's tongue; these stories need confirmation. The Grampus possesses great strength and activity.

GRAN: county of n.w. Hungary, intersected by the rivers Danube and Gran; 424 sq. m. It is fertile, producing grain, fruits, and wine; and abounds in marbles, limestone, and coal. Chief town, Gran. Pop. about 65,400, mostly Magyars.

GRAN, *grân* (Mag. *Esztergam*): town of Hungary, finely situated on an elevation on the right bank of the Danube, 25 m. n.w. of Pesth. It is a royal free town, is the see of the primate of Hungary, has a large cathedral, after the model of St. Peter's at Rome; one of the finest churches in Hungary. The town is rich in fine buildings. Pop. (1890) 9,349. Gran, which is one of the oldest towns of Hungary, was the residence of the Hungarian prince Gejza; and here his son, St. Stephen, first king of Hungary, was born 979, and converted to Christianity 1000. It was formerly fortified, and has undergone assaults and sieges almost without number.

GRANADA, *grâ-nâ'da*, Sp. *grâ-nâ'thâ:* ancient kingdom, one of the old provinces in s. Spain. It was bounded w. by Andalusia, e. by Murcia, and s. and s.e. by the Mediterranean. Its greatest length from n.e. to s.w. was about 210 m., greatest breadth about 80 m. It is now divided into the three modern provinces of Granada, Almeria, and Malaga, united areas 11,063 sq. m.: united pop. (1900) 1,363,462. The surface of this ancient province is mountainous and highly pictur-

esque. The mountain-ranges—the chief of which are the Sierra Nevada, the Sierra de Ronda, and the Alpujarras—generally run parallel with the coast. The principal rivers are the Almanzora, Almeria, Jenil, Guadalhorce, and Guadiaro, all of which—except the Jenil, an affluent of the Guadalquiver—flow into the Mediterranean. The province of Granada is, on the whole, fruitful and highly cultivated. The mountains are rich in silver, copper, lead, and iron; and many of the inhabitants are engaged in mining and smelting. Saline and mineral springs abound. In the time of the Romans, Granada was a portion of the province of Bactica; but after the Arab invasion it formed an independent Moorish kingdom. For a time it was exceedingly wealthy. From 1248 the Moorish kings of Granada were forced to recognize the supremacy of the kings of Castile. A quarrel, however, which arose between the vassal king of Granada and Ferdinand and Isabella in the 15th c., resulted in the war of 11 years, the consequence of which was the complete conquest of Granada by the Spaniards 1492, and the total destruction of Moorish authority in Spain. The modern province of Granada has 4,920 sq. m. Pop. (1900) 492,460.

GRANA'DA (Spanish, *Granata*, Arab, *Garnathah*, said to be a corruption of *Karnáttah*, the ancient fortress of Phœnician origin), famous city of Spain, formerly cap. of the kingdom of Granada, and now chief town of the modern province of Granada. It is built on a northern branch of the Sierra Nevada, 2,445 ft. above sea-level, lat. 37° 15′ n., long. 3° 45′ w.; about 140 m. e.s.e. of Seville. It stands on the right bank of the Jenil, overlooking the fertile and extensive *Vega* or plain of Granada, and is watered also by the Darro, a rapid mountain-stream, which joins the Jenil about a mile below the town. Though now sadly decayed, it is still one of the greatest towns of Spain, is the seat of an archbishop, and has a university, attended, it is said, by about 800 students. One of the two hills on which the town mainly is built is surmounted by the Alhambra (q.v.); the other hill is occupied by the suburb called the Albayzin, the oldest part of the town, and now inhabited almost entirely by gypsies. The city of Granada proper, namely, that portion that contains the Alhambra, is surrounded by high but ruinous walls, and by strong towers. The streets are narrow, crooked, and uneven; the houses, mostly well built, are heavy and gloomy in outward appearance, having the flat roofs and projecting balconies of Moorish architecture; the interiors, however, are convenient and suitable to the climate. Granada has several charming public squares. The cathedral, a splendid structure, profusely decorated with jaspers and colored marbles, and having a high altar under a dome supported by 22 pillars contains the monuments of Ferdinand and Isabella,

and of Philip I. and his consort Juana. The industry and trade of the town are inconsiderable. Pop. (1900) 75,900.

The modern city of Granada was founded by the Moors in the 8th c.; and for some time remained subject to the caliphs of Cordova; but 1235 it became cap. of the kingdom of Granada, and rapidly rose to distinction as a wealthy trading city and as the seat of arts and architecture. Under the Moors, it attained its highest prosperity. Toward the close of the 15th c., it is said to have had 40,000 inhabitants, and to have been surrounded by a wall fortified with 1,030 towers. The *Vega* of Granada, in front of the city, was celebrated for two hundred years as the scene of the contest between the Moors and the chivalry of Christendom —a contest ended only by the capture and complete subjection of Granada, the last Moorish stronghold in Spain, by Ferdinand and Isabella 1492, after a siege of 12 months.

GRANADA, *grâ-nâ'dâ:* province of Nicaragua, between lakes Nicaragua and Managua bounded w. by the Pacific Ocean; 2,943 sq. m. A low range of mountains extends through the central portion, and in the n. and w. parts are Mombacho, Masaya, Madera, and Ometepe volcanoes. The province contains a large stretch of cultivated and thickly populated table-land, numerous mineral springs, a considerable quantity of precious minerals, several small lakes (see also lake NICARAGUA) and a few shallow, non-navigable rivers. Pop. 56,000.

GRANADA: city of Nicaragua in the dept. of Granada: on the n.w. side of Lake Nicaragua. It was founded by Hernandez de Cordova 1522. Prior to 1854, it was the thriving seat of many commercial establishments. It suffered greatly, however, from the civil war that broke out in the republic during that year, and was under siege 1854, May—1855, Feb.; but was bravely and successfully defended by Don Fruto Chamorro, leader of the conservative party. In 1856, Chamorro having in the meantime died, Granada was surprised and taken by the democrats, but was retaken and almost wholly destroyed in the following year. After peace, efforts were made toward the restoration of the city. It has not yet, however, regained its former prosperity and importance. Pop., including the suburbs and the municipality of Jalatava, 25,000.

GRANADILLA, *grăn-a-dĭl'la:* edible fruit of certain species of Passion-flower (q.v.). The name, originally bestowed by Spanish settlers in the W. Indies and warm parts of America, is a diminutive of *granada*, a pomegranate. The COMMON GRANADILLA (*Passiflora quadrangularis*) is extensively diffused over these regions, and much cultivated. The plant is a luxuriant and very ornamental climber, often employed to form

arbors and covered walks; it has large, beautiful, and fragrant flowers; oblong fruit, often six inches in diameter, of agreeable fragrance, and a sweet and slightly acid pulp, very gratefully cooling. It is often eaten with wine and sugar.—The APPLE-FRUITED GRANADILLA, or SWEET CALABASH (*P. maliformis*), is plentiful in the woods of Jamaica, where it forms a principal part of the food of wild swine. It is a very agreeable fruit, about two inches in diameter, its pulp gelatinous, the rind so hard as to be sometimes made into snuff-boxes and toys. The LAUREL-LEAVED GRANADILLA (*P. laurifolia*), sometimes called water-lemon in the W. Indies, is a fruit about the size of a hen's egg; the plant has red and violet fragrant flowers, and very long tendrils. The fruit has a whitish pulp, so watery, that it is usually sucked through a hole in the rind; it has a delicious flavor, and a slight acidity. It is much cultivated.

GRAN'BERY, JOHN COWPER, American bishop of the Methodist Episcopal Church South: b. Norfolk, Va., 1829, Dec. 5; d. Ashland, Va., 1907, Apr. Graduated from Randolph-Macon College in 1848, he entered the Methodist ministry in that year, was a chaplain in the Confederate army in 1861–5, and in 1875–82 professor of moral philosophy and practical theology in Vanderbilt University. His publications include: *Twelve Sermons* (1896) and *Experience the Crowning Evidence of the Christian Religion* (1900).

GRANBY, *grăn'bĭ*, JOHN MANNERS, Marquis of: English general: 1721, Jan. 2—1770, Oct. 20; eldest son of the third Duke of Rutland. Educated at Eton and Cambridge, he was at an early age elected M.P. for Grantham. In the rebellion of 1745, he raised a regiment of infantry, and accompanied the Duke of Cumberland into Scotland. Appointed col. of the horse guards 1755, in 1759, Feb., he received the rank of lieut.gen., and soon was sent to Germany as second in command, under Lord George Sackville, of the British troops, co-operating with the king of Prussia. After the battle of Minden, for his conduct in which he received the thanks of Prince Ferdinand of Brunswick, to the disparagement of his superior officer, who resigned, and was afterward cashiered, he was appointed commander-in-chief of the British troops, and held that post during the remainder of the seven years' war. He particularly distinguished himself at the battles of Warburg 1760, of Kirchdenkern 1761, and of Græbenstein and Homburg 1762. In 1760 during his absence with the army, he was appointed a member of the privy council. After the peace of 1763, he was constituted master gen. of the ordnance, and 1766 commander-in-chief of the army. Though very popular in his time, as evidenced by the frequency with which his portrait was used as a sign to public houses, he was the subject of some of the most terrible

invectives of Junius; and his military qualities appear to have been much overrated by his contemporaries.

GRAND, a. *grănd* [F. *grand;* It. *grande*—from L. *grandis,* great, large]: splendid; sublime; lofty; great, as applied to size; the second degree of parentage or descent, as *grandmother;* principal or chief as *grandmaster;* in *music,* synonymous with great—e.g., grand sonata, grand symphony, signifying that the composition is full, not simple or easy. GRAND'LY, ad. *-li.* GRAND CAPE, *in English law,* the name of the writ whereby in an action of dower, on the failure of the defendant to appear to answer to the summons, a third part of his lands are attached to await the decision of the court. GRAND JURY, a jury of the good and true men of the country who decide whether there is sufficient evidence to put any persons accused on trial. GRANDCHILD, n. a son's or daughter's child, the male being a *grandson,* the female a *granddaughter.* GRANDFATHER, or GRANDSIRE, n. the father of one's father or mother. GRANDMOTHER, n. the mother of one's father or mother. GRANDEE, n. *grăn-dē'* [Sp.]: a Spanish nobleman; a man of great rank. GRANDEE'SHIP, n. the state or rank of a grandee. GRAND'NESS, n. magnificence; greatness. GRAND'EUR, n. *-yėr* [F. greatness]: splendor of appearance; that which excites a feeling or sentiment of greatness; elevation of sentiment, language, or mien.—SYN. of 'grand': noble; imposing; majestic; stately; splendid; magnificent; superb; august; dignified; elevated; pompous; exalted; extensive; chief; principal; eminent; superior.

GRAND, SARAH, pseudonym of FRANCES ELIZABETH CLARKE, English novelist: b. Ireland. When 16, she married Lieut.-Col. M'Fall, with whom she traveled in India, China and Japan; in 1901 she visited the United States. She has been active in the woman's movement, in England, serving as president of a Society for Woman's Suffrage, and of the Woman's International Progressive Union, and as vice-president of the Scottish Association for the Promotion of Woman's Public Work. Her first novel was *Ideala,* written at 26, but the first work to give her a wide reputation was *The Heavenly Twins* (1893). Her other writings include: *Singularly Deluded; A Domestic Experience; Our Manifold Nature* (1894); *The Beth Book* (1897); *The Modern Man and Maid* (1898); *Babs the Impossible* (1900).

GRAND ALLIANCE: compact between Emperor Leopold I. of Germany, and Holland, to which England, Spain, and Saxony were subsequently admitted, agreed to at Vienna, 1689, May 12, for the purpose of preventing the union of France and Spain as a single monarchy.

GRANDAM, n. *grăn'dăm* [Eng. *grand,* and *dam*]: a grandmother; an old withered woman.

GRAND ARMY OF THE REPUBLIC: national or-

ganization of the survivors of the Union army and navy of the war against secession. The first post, as the local subordinate bodies are called, was organized in Decatur, Ill., 1866, Apr. 6; the first national convention of veterans was held in Indianapolis, 1866, Nov. 20; and the national encampment, or supreme body, was formed in Philadelphia 1868, Jan. 15. The constitution of the G. A. R. in its present form provides that 'soldiers and sailors of the U. S. army and navy, and marine corps, between Apr. 12, 1861, and Apr. 9, 1865, in the war for the suppression of the rebellion, and those having honorable discharge therefrom for such service, and of such state regiments as were called into active service and subject to the orders of U. S. general officers between the dates mentioned, shall be eligible to membership in the Grand Army of the Republic. No person shall be eligible who has at any time borne arms against the United States.' The organization is designed to be patriotic, benevolent, and non-political in character. In 1906, June 30, the total membership was reported at 227,970, and the Grand Army posts numbered, 5,942. The G. A. R. makes a special business of observing Decoration Day and looking after the pension interests of its numbers.

GRAND BANK, in the Atlantic ocean: part of the submarine 'Telegraphic Plateau,' lying e. of Newfoundland, about 600 m. long, 200 m. wide, and 30 to 60 fathoms below sea-level. On this plateau lie the British and French submarine cables. It is supposed to have been formed by the precipitation of gravel, earth, and stone brought from Greenland by icebergs and released from the ice by the action of the warm water of the Gulf Stream. The Grand Bank is one of the most noted cod-fishing regions of the world, and by international treaties fishermen of the United States, England, France, and Canada have equal privileges there.

GRANDEES' [Span. *grandes*]: the most highly privileged class of the nobility of the kingdom of Castile: the term has been in use since the 13th c. To this class belonged the whole of that very powerful portion of the nobility who, from their wealth, were called the *Ricos Hombres* by pre-eminence; and to whom, moreover, the crown had granted the right of bearing a banner, and of gathering mercenaries around it on their own account. The members of the royal family were as such included among the Grandees. The honors were hereditary; the Grandees held lands from the crown on the tenure of military service, being bound to produce a certain number of lances, each lance being represented by a knight with four or five men-at-arms. The Grandees were exempted from taxation, and could not be summoned before any civil or criminal judge without a special warrant from the king. They were entitled to leave the kingdom, and even to enter the service of a foreign

prince at war with Castile without incurring the penalties of treason. In all public transactions they had the right to remain covered in the presence of the king. In the national assemblies, the Grandees sat immediately after the prelates and before the titled nobility, They had free entrance into the palace, and into the private chambers of the monarch; and on the occasion of religious solemnities, they had their place in the chapel-royal next to the altar. Their wives shared their dignities, the queen rising to greet them.

GRAND FORKS, N. Dak., city, capital of Grand Forks co.; on the Red River of the North and Red Lake river, and the Northern Pacific and Great Northern railroads, 80 m. n. of Fargo. It is the seat of the N. Dak. State Univ., opened in 1884, the Grand Forks College, and the Northwestern Normal and St. Bernard's Colleges. The city is located in a rich agricultural section, and among its chief manufactures are flour, lumber, foundry products, bricks, woolen goods, and steam boilers. It also has a large trade in live-stock, wheat, oats, and potatoes, the latter especially being widely known for their excellence. The place was settled in 1871, and incorporated 1881; and during the past decade its population has increased more than 50 per cent. The water-works and electric light plant for street lighting are owned by the municipality. Pop. (1910) 12,478.

GRAND HA'VEN, Mich., city, port of entry, and capital of Ottawa co., on Lake Michigan at the mouth of Grand River, and on the Detroit, G. H. & M., and the Chicago & W. M. railroads, 110 m. n.e. of Chicago. A settlement was established here in 1835, and the city is now a summer resort of considerable reputation, with a noted mineral spring. The municipality owns the waterworks and electric lighting plant, and has electric street railways, a public library, and a fine park. Akeley College for girls is a prominent educational institution; in addition to which there is an excellent public school system. There is a good harbor, with two light-houses, and the city maintains steamboat connection with the leading lake ports. It has a large trade in flour, lumber, leather, etc., and manufactures on a more or less extensive scale lumber, wooden-ware, furniture, refrigerators, machinery, pianos, brass novelties, matches, shoes, barrels, etc. Pop. (1910) 5,856.

great; *loquentem*, speaking—from *loquor*, I speak]: pompous in language: bombastic. GRANDIL'OQUENCE, n. *-kwĕns*, pomposity of language. GRANDIL'OQUENTLY, ad. *-lĭ*.

GRAND ISLAND, *-īl'and*, Neb., city, capital of Hall co., near the Platte river, and on the Burlington & M., the Union Pacific, and the St, Joseph & Grand Island

railroads, about 85 m. w. of Lincoln. A permanent settlement was made here in 1869, and in 1872 it was incorporated as a town. The surrounding country is a fertile agricultural section, and beet-sugar, flour, canned fruits and vegetables, broom-corn, etc., are manufactured to a large extent. The place has an extensive trade in live-stock and manufactured articles; it also has a number of wholesale establishments and is the distributing centre for a large section of n.w. Nebraska. The State Soldiers' and Sailors' Home is located here; also St. Francis Hospital, a modern and well equipped institution. Grand Island College, opened in 1892, is under the auspices of the Baptist church, and it has an excellent free library. The municipality owns the waterworks. Under the present city charter a mayor and city council are elected biennially. Pop. (1905) about 8,000.

GRAND JURY, or GRAND INQUEST: assembly of men drawn from the same class as the ordinary or petit jury, summoned by a sheriff to attend at sessions of courts, for the purpose of inquiring into the charges for offenses and determining whether persons accused of crime shall be indicted and tried therefor, and for inquiring into other matters assigned to them by the court or within their knowledge—returning to the court their delivery thereon.—The institution of the grand jury dates back to the earliest period of English history, having been in use among the Saxons. The number of the Grand Jury was originally 12, but we learn from Bracton that, in the time of Henry III., it was the practice to return four knights for every hundred, who elected 12 other knights, or else *liberos et legates homines*, to take part with them in the inquest. This jury was called *le graunde inquest*, and made inquiry for the county, while the jury for the hundred inquired for its own district only. After the establishment of the *graunde inquest*, the practice of summoning a jury of the hundred gradually went out of use; but until 6 Geo. IV. c. 50, it was deemed necessary that some of the grand jury should be summoned for every hundred. In the present day, in England, and in the United States, the grand jury must consist of not less than 12, and usually not more than 23 members. The number varies in different states. The qualification of grand jurors is the same as that of the petit jury. See JURY TRIAL. The court may select the foreman or allow the jury to select. The foreman, and then each member of the grand jury takes the oath. After having the oath administered, and receiving an explanatory charge from the judge, they retire to their room, and the various indictments, called bills, duly indorsed with names of witnesses, are laid before them by the state's attorney. The foreman presides, and one of the jurors may be appointed secretary. They do not examine witnesses for the defense; for the duty of the grand jury is not to

find a verdict, but only to decide whether there is sufficient *prima facie* evidence to require a trial. For this purpose, they may require the same evidence, written and parol, as may be necessary to support the indictment at the trial. But in practice, having ascertained that the govt. has a sufficient *prima facie* case, they return a true bill, the prisoner's evidence being reserved for the trial. Witnesses are sworn on their examination before the grand jury by an officer appointed by the court. When the jury have come to a conclusion, the clerk indorses on the indictment *a true bill* in case the jury, or a majority of 12, are satisfied that the case is sufficiently strong. In case they are not thus satisfied, the indictment is indorsed *not a true bill.* The foreman, accompanied by one or more of the jurors, then carries the indictments into court, and presents them to the clerk, who states to the court the nature of the charge, and the indorsement of the jury. A bill having been thrown out by the grand jury it cannot be preferred to the same grand jury during the same assizes or sessions. The grand jury must attend till discharged by the court. When a prisoner is brought in after the jury has been discharged, it is competent to swear a new jury.

GRAND (or CHETIMACHES, *chĕt-tĭm-atch'iz* or *shĕt-mâsh'*) LAKE: in Iberia, St. Martin's, and St. Mary's parishes, La.; supplied by the overflow of Atchafalaya Bayou; about 35 m. long, and 10 m. wide; very shallow, and with no value for navigation.

GRAND (or SCHOODIC, *skó'dĭk*) LAKE: body of water forming part of the boundary between the United States and the province of New Brunswick; chiefly in Washington co., Me.; about 25 m. long, and 4 m. wide. It discharges its waters through the St. Croix river at the s.e. end, and is famous for trout and land-locked salmon.

GRAND MANAN, *man-ăn'*, or GRAND MENAN, *mĕn-ăn':* island off the e. coast of Me., in the bay of Fundy, belonging to Charlotte co., New Brunswick; about 22 m. long, and 3-6 m. wide. with n.e. head in lat. 44° 45′n., long. 66° 45′ w., and s.w. head in lat 44° 34′ n., long. 66° 53′ w. The shores are high and bold; the interior—a high plateau rather than mountainous—is fertile and well timbered, and it has several fine harbors. It has large herring, haddock, and cod-fishery interests, a lighthouse, and many attractions as a summer resort. The chief place is Grand Harbor. Pop. about 3,000.

GRAND PEN'SIONARY. Formerly the syndic of each of the important towns of Holland was termed a pensionary, and the state secretary for the province of Holland, a grand pensionary. Until the time of Olden Barneveldt (q.v.), the grand pensioner was also advocate-general for the same province. He collected votes,

wrote the decrees, read the letters addressed to the states, conducted negotiations with foreign ambassadors and ministers, and took charge of the revenues of the province, of its rights and privileges, and whatever else pertained to its welfare. He was a perpetual member of the states-general of the United Netherlands, and thus, as first magistrate of the first of the United Provinces, he acquired immense influence over all Holland, and may be considered premier of the Dutch parliament. The grand pensionary held his office for five years, but was in most cases re-elected. The office was abolished in 1795.

GRAND RAPIDS, *grănd răp'idz*, Mich., city and cap. of Kent co.; on Grand river at the head of steam navigation, and on the Michigan Central, the Lake Shore & Michigan Southern, the Père Marquette, the Grand Rapids & Indiana, the Grand Trunk and several other railroads. The city is located 30 m. from Lake Michigan and 60 m. w. by n. of Lansing, the capital of the state. A settlement was made here in 1833, on the site of an abandoned Indian village, and the place was chartered as a city in 1850. The name is derived from the Grand Rapids of Grand river, which have a fall here of about 18 feet, supplying an abundance of fine water-power. The city is a base of supplies and distributing point for the western and northern portions of the state, and it has a large wholesale and jobbing trade in groceries, provisions, clothing, dry goods, millinery, carpets, crockery, drugs, paper, cigars, boots and shoes, knit goods, sporting goods, hardware, mill supplies, and other lines. Its chief industry, however, is furniture, with 38 factories and an invested capital of more than $8,000,000, and an annual product of about $9,500,000. Only two other cities in the United States, Chicago and New York, exceed Grand Rapids in their output of furniture.

The fruit trade of Grand Rapids is a very important item. In 1904 the peach crop of northern Michigan was a partial failure, and yet in that year 479,000 bushels of peaches were marketed at that place; also 741,000 bushels of apples, 57,000 bushels of cherries, 52,000 bushels of plums, 8,300 barrels of pears, 200,000 crates of strawberies, 96,000 crates of blackberries, 91,000 of raspberries, besides large quantities of other fruits. The value of the fruit crop alone for that year was estimated at $1,850,280. It is claimed that the average crop of peaches marketed here will exceed 1,000,000 bushels.

The city has five national banks with a capital of $2,300,000, six state banks and a trust company, the latter naving a capital of $200,000. All the religious denominations are represented with congregations and churches, the value of church property being estimated at more than $1,500,000. It is the seat of the bishops of the Catholic and Episcopal dioceses, and the former denomination has a handsome cathedral. The Holland

Theological Seminary, one of the leading institutions of the Holland Reformed Church in America, is located here, and this denomination, with the Catholics and Lutherans, have parochial schools which accommodate more than 5,000 pupils. The value of the public school buildings is estimated at $1,510,000, and they embrace 35 ward schools and one high school. They are maintained by a general tax, at an expenditure of about $400,000 per annum. The Ryerson Public Library, a gift to the city of his birth by Martin A. Ryerson of Chicago, contains 65,000 volumes, and the Natural History Museum occupies buildings and property costing more than $30,000. The Michigan Soldiers' Home, maintained by the state with accommodations for 1,000 veterans and 200 widows, is located 3 m. n. of the city; and the Michigan Masonic Home, maintained by the Michigan Grand Lodge of Masons, with 250 inmates, is located 3 m. e. of the city. There are three large hospitals, two orphan asylums, a home for the aged, two refuges for unfortunate women, and several minor philanthropic institutions. In addition to these the city maintains a general hospital, and the county a farm and hospital. There are three daily newspapers, besides a number of weekly and monthly publications, and four first-class theatres. There are four principal parks, with an aggregate valuation of $350,000, besides a number of squares and small parks which contribute materially to the beauty of the city. Comstock Park of 100 acres, is owned by the West Michigan Fair Association, and should it cease to be used for that purpose it is to revert to the city. The city owns the waterworks, which are supplied from Grand river; also the electric lighting plant and garbage burner and market. The river is spanned by six handsome bridges, all of which are owned by the city. Pop (1910) 112,571.

GRAND RIV'ER: tributary of the Colorado river, rising in Grand Lake in the n.e. part of the Middle Park, flowing in a w.s.w. direction, crossing the w. boundary of Colo., thence flowing s.w., and uniting with the Green river in Utah. Its chief tributaries are the Gunnison and Dolores rivers. It is about 350 m. long and in Middle Park runs through a granite cañon for 3 m. between walls 1,000-1,500 ft. high.

GRAND RIV'ER: river of Michigan, rising in the s.e. part of the state, in two branches which unite near the city of Jackson; thence flowing in a general w.n.w. direction, and emptying into Lake Michigan at the city of Grand Haven (q.v.). G. R. is navigable for large steamers to the rapids, 40 m. from its mouth, and for small boats 50 m. further; whole length 270 m.

GRAND SER'JEANTY [Lat. *magna serjeantia*, or *magnum servitium*, great service]: the most honorable of the ancient feudal tenures. According to Lyttletar, G. S. in Britain is where a man holds his lands or tene-

ments of the sovereign lord the king by such services as he ought to do in his proper person to the king, as to carry the banner of the king, or his lance, or to lead his army, or to be his marshal, or to carry his sword before him at his coronation, or to be his carver, or his butler, or one of his chamberlains of the receipt of his exchequer, or to do other like services. This tenure must have been held of the king. Where lands were held of a subject, on condition of performance of services identical with those which were rendered to the king, the tenure was not G. S., but knight's service. Thus, lands on the Scottish border held of the king by cornage, i.e., on condition of winding a horn to give notice when the Scots had crossed the border—where held in G. S.; but lands held of a subject for the same service where held in knight's service. The services in G. S. were to be performed by the tenant in person, where he was able to do so. The office of attendance on the sovereign's person was esteemed so honorable, that no one below the dignity of a knight could perform it. This tenure by G. S. was by 12 Charles II. c. 24, in common with other military tenures, reduced to common Socage (q.v.), except as regards the honorary services, which continue to be observed to this day. Thus, the Duke of Wellington holds of the crown his estate of Strathfieldsaye on condition of presenting to the sovereign a flag bearing the national colors on each succeeding anniversary of the battle of Waterloo. The manor of Woodstock, with the demesne, in which is Blenheim Park, is held by the Duke of Marlborough by G. S., on condition of presenting to the queen and her heirs, at the castle of Windsor, a standard of France, on Aug. 13 yearly, the anniversary of the day on which the battle of Hochstädt was fought, near the village of Blenheim, on the Danube. The tenure of G. S. was observed throughout Europe. 'The freeborn Franks,' says Mr. Hallam, *Middle Ages*, 'saw nothing menial in the titles of cupbearer, steward, marshal, or master of the horse, which are still borne by the noblest families in every country in Europe, and by sovereign princes in the empire. The Count of Anjou, under Louis VI., claimed the office of great seneschal of France—i.e., to carry dishes to the king's table on state-days. Thus, the feudal notions of grand serjeanty prepared the way for the restoration of royal supremacy, as the military tenures had impaired it.'

GRANDVILLE, *grâng-vēl'*, Jean Ignace Isidore Gérard (name Gérard, pseudonym Grandville): 1803, Sep. 3—1847, Mar. 17; b. Nancy: French caricaturist. In 1828 he published the first of a series of humorous sketches, *Les Métamorphoses du Jour*, which were highly thought of; soon afterward another series, *Les Animaux Parlants*. After the July revolution, G., with Decamps and Daumier, became the moving spirit of the 'Caricatures.' His *Convoi de la Liberté*, his *Basse Cour*, *Mat de Cocagne*, etc., as pictures of the politics and manners of the times, are of great and lasting value. He also contributed illustrations to new and splendid editions of the *Fables* of La Fontaine and Florian, the *Adventures of Robinson Crusoe*, *Gulliver's Trav*

cls, Abel Hugo's *Vie de Napoleon*, Rayblaud's *Jérome Paturot*, etc. Though some of Grandville's designs are absurd, his work in general shows high inventive power and great refinement.

GRANGE, n. *grānj* [F. *grange*, a barn; Span. *granja*, a farm—from L. *granum*, corn: comp. Gael. *grainn-seach*, a depository for grain]: a granary, a farmhouse, or more broadly a rural estate with its attached buildings. In the United States since 1867, name applied to the state and subordinate organizations of the national agricultural association, Patrons of Husbandry, whose members were called *Grangers*. See HUSBANDRY, PATRONS OF.

GRANGEMOUTH, *grānj'mŭth:* rising port in Stirlingshire, Scotland, 3 m. from Falkirk, at the entrance of the Forth and Clyde canal. It is on the Carron river, nearly 2 m. from its mouth on the estuary of the Forth. The trade of Grangemouth has rapidly risen of late years. It has extensive quays and warehouses; docks (including a large one opened 1882, and a graving-dock) and ship-building yards. The immense docks are 28 acres in extent, the timber basins cover 32 acres, and the total quayage amounts to about 2,300 yards. The principal industries are ship-building and coal-mining, while the manufacture of iron and steel, brick and tile is carried on to a considerable extent. A public park was opened 1882. The imports are timber, hemp, flax, tallow, deals, iron, grain; and iron, corn, and wool are exported. Pop. 8,000.

GRANGER, *grān'jėr*, GIDEON: 1767, July 19—1822, Dec. 31; b. Suffield, Conn.: statesman. He graduated at Yale College 1787, attained wide distinction as a lawyer, served several years in the state legislature, was one of the originators—if not the author—of the Conn. School Fund, was U. S. postmaster-gen. 1801-14, removed to Canandaigua, N. Y., and became state senator, 1819, co-operated with De Witt Clinton in establishing his system of internal improvements, and retired from public life 1821. His son, FRANCIS G. (1792, Dec. 1—1868, Aug. 28), graduated at Yale College 1811, became a lawyer, was whig candidate for vice-pres. of the United States on the ticket with William Henry Harrison 1836, was member of congress 1835-37, 1839-40 appointed U. S. postmaster-gen. 1841.

GRAN'GER, GORDON: 1821-76, Jan. 10: b. New York: soldier. He graduated at the U. S. Milit. Acad. 1845, was brevetted 1st lieut. and capt. for services at Contreras, Churubusco, and Chapultepec; appointed col. 2d. Mich. cav. 1861, Sep. 2; brevetted maj. U. S. A. for gallantry at Wilson's Creek, Mo.; promoted brig.-gen. 1862, Mar. 26, and maj.-gen. Sep. 17; brevetted lieut.-col. and col. U. S. A. for Chickamauga and Chat-

tanooga, brig.-gen. for Mobile, and maj.-gen. for Forts Gaines and Morgan; mustered out of the vol. service 1866, Jan. 15; appointed col. 25th U. S. inf. 1866, July, transferred to the 15th U. S. inf. 1870, and commanded it and the dist. of N. Mex. till his death.

GRAN'GER, Robert Seaman: soldier: b. Zanesville, O., 1816, May 24; d. 1894, April 25. He graduated at the U. S. Milit. Acad. 1838, served in the Seminole war, was assistant instructor of tactics at the U. S. Milit. Acad., was promoted capt. for services in Mexico, and performed frontier duty till 1861, Apr. 27, when he was captured by the Confederates in Tex. He was appointed brig.gen. of Ky. state troops 1862, Sep. 1, brevetted col. U. S. A. for services at Shepherdsville, Lebanon Junction, and Lawrenceburg; promoted brig.gen. vols. 1862, Oct. 20; commanded dists. of Nashville and Middle Tenn. 1863, superintended the defenses of Nashville 1864, successfully defended Decatur against a Confederate siege 1864, Oct., brevetted mej.gen. U. S. A., promoted lieut.col. 1865, June 12, and col. 1871, Aug. 16, and placed on the retired list 1873, Jan. 1.

GRANIER DE CASSAGNAC, *grâ-nē-ā' dĕh kâ-sân-yâk'*, Bernard Adolphe: Parisian journalist, and political partisan: 1808–1880, Jan. 30; b. at Averon-Bergelle, in the dept. of Gers. He was educated at the College of Toulouse, and soon quitting the provinces for Paris, was introduced by Victor Hugo to the *Journal des Debats* and *Revue de Paris*. Here his vehement style did not give satisfaction, and he was engaged by M. Girardin to write literary criticisms for *La Presse*. In 1840, he sailed for the Antilles, in hopes of political advancement, ingratiated himself with the planters, though he narrowly escaped being murdered by the blacks, married a Creole lady, Mademoiselle Beauvallon, and returned to Paris as deputy for Guadeloupe. He founded the *Globe*, ultra-Orleanist, and violent to such a degree that the opposition journals agreed to ignore it (*la conspiration du silence*, as it was called). The *Globe* failed; and 1842 Granier de Cassagnac started *L'Epoque*, also violent, and a failure. In 1848 he returned to France from a short stay in Rome, and soon reappeared in Paris as an ardent supporter of Louis Napoleon the Prince President, and a bitter foe to his old patrons, the House of Orleans. He edited the *Pouvoir* (1850), and wrote for the *Constitutionnel* with an excess of zeal and a pretense of exclusive information. In 1852 he was elected as the govt. candidate for Mirande (Gers), and re-elected 1857,63. 1857, he was made grand officer, and 1865 commander of the Legion of Honor. 1867 he founded *La Réveil*, weekly religious organ, which suspended the next year. He afterwards became principal editor of the semi-official *Pays*, and 1863 manager of the *Nation*. 1870, on the fall of the empire, he retired to Brussels; 1876 he was elected to the national assembly.

The appearances of Granier de Cassagnac before the courts of justice were very numerous on account of debt, libel and duelling. His most important works are: *A Voyage to the Antilles* (1844); *The Queen of the Prairies*, romance (1845); *The Causes of the French Revolution of* 1789 (1850); *The History of the Directory*, reprint from the *Constitutionnel* 1851–56); *The Fall of Louis Philippe* (1857); *The Girondins and the Massacres of September* (1860), etc. All his writings are remarkable for vigor of style, but the partisanship greatly impairs their value.

GRANITE, n. *grăn ĭt* [F. *granit*, granite—from It. *granito*, kernelly or gritty, as figs or oil in winter: L. *granum*, grain, corn]: plutonic rock, having a granular-crystalline composition and appearance, and composed of quartz, felspar, and mica, in grains or crystals. GRANITIC, a. *gră-nĭt'ĭk*, or GRANIT'ICAL, a. *-ĭ-kăl*, partaking of the character and appearance of granite. GRAN'ITOID, a. *-ĭt-oyd* [Gr. *eidos*, likeness]: applied to such rocks as have the granular-crystalline aspect of granite. GRAPHIC GRANITE, *graf'ĭk-* [Gr. *graphō*, I write]: a compound of felspar and quartz, the quartz being disposed through the felspar matrix like lines of Arabic writing.

GRANITE. The etymology of this word is *granum*, a grain, or particle. It was used by the early Italians in the 16th century before the distinctions between rocks were clearly understood. Its implication, a rock consisting of different masses or particles, would apply as well to a sandstone or some kinds of marble as to an igneous crystallized mass of which the granite of our day is the type.

In fact it was called 'marmor granitus.' Werner gave it its present precise definition, restricting it to the rock now known under this name. It* is defined as a phanerocrystalline (i.e., crystallized, igneous rock composed of quartz (q.v.) and feldspar (q. v.) of any kind, with mica, hornblende or other ferro-magnesian minerals present in subordinate amount. Zirkel and Rosenbusch, who are followed by most modern geologists, define it as a massive crystallized rock of pre-tertiary age containing orthoclase (potash feldspar) and quartz. The massive crystallines are usually of eruptive origin, i.e., thrust upward in hot molten condition from the earth's interior. It is coarse to fine, very generally interspersed with flakes of silvery mica (muscovite). Its feldspar constituent predominates and is chiefly orthoclass, but very frequently plagioclase, in the form of oligoclase, is present. See FELDSPAR.

The variety of orthoclase most constantly present is pegmatite, which gives its pink or reddish color to the rock, but gray and greenish granites are also abundant, deriving their characteristic color usually from oligoclase.

The quartz is usually in irregular grayish grains or

*Quantitative classification of igneous rocks by Cross, Iddings, Pirrson, Washington.

angular masses, with strong greasy or glassy lustre, which very often have cavities containing fluid inclusions, sometimes water, sometimes solution of salts, and sometimes liquified carbon di-oxide.

A mean of a great many analyses of fragments of granite shows silica 72 per cent., alumina 16 per cent., ferrous and ferric oxides 1.5 per cent., calcium oxide (lime) 1.5 per cent., magnesia 0.5 per cent., potash 6.5 per cent., soda 2.5 per cent.

The size of the constituent parts of a granite varies from that of a human head to that of millet seed, and less.

Granite occurs in two different conditions. In its oldest form it appears occasionally to have suffered a gradual transformation to a parallel structure like that of true gneiss. These granites belong to the oldest laminated gneiss formation. The other is that of an extruded mass pressed up from considerable depths and frequently filling the interstices between the rocks from beneath which they have risen. This latter form is the more typical and the least ancient. Occurrences of it have been ascribed to each of the periods below the Tertiary. It gives rise to a peculiar topography, easily recognized, generally of dome shaped, rounded, or vaulted hills and mountains, without precipices, sharp peaks, or angular terminations. But occasionally it appears in sharp peaks as in the *aiguilles* of the Alps and elsewhere.

There is an absence of cementing material between the crystals of typical granite which is also a characteristic of the rock, though not absolutely without exception.

As an example of exact modern methods of petrology in translating the chemical analysis of a mass of granite into its constituent minerals the following granite from Butte, Montana, is taken from the work before cited.

ANALYSIS OF A GRANITE FROM WALKERVILLE STATION, NEAR BUTTE, MONTANA.

Chemical Constituents.		Mineral Constituents.		
SiO_2	63.88	Quartz		19.38
Al_2O_3	15.84	Orthoclase	Feldspars	25.02
Fe_2O_3	2.11	Albite	Feldspars	23.58
FeO	2.59	Anorthite	Feldspars	18.07
MgO	2.13	Diopside		—.67
CaO	3.97	Hypersthene		6.78
Na_2O	2.81	Magnetite		3.01
K_2O	4.23	Ilmenite		1.22
H_2O+	—.66	Pyrite		—.24
$H_2O—$	—.22	Apatite		—.31
TiO_2	—.65	Etc		—.99
P_2O_5	—.21			99.27
MnO	—.07			
SrO	—.02			
BaO	—.09			
Li_2O	— tr			
SO_3	—.34			
Cl	— tr			
	99.82			

The edges of the orthoclase crystals, in some granites with large constituent crystals, present to the eye the

appearance of Hebrew letters, and this variety is known as 'graphic' granite. The presence of notable quantities of any mineral, not a necessary part of the rock, is used as a descriptive prefix to the granite. Thus when hornblende occurs the granite is called syenitic, from the character of the rock at Syene in Egypt. Strictly speaking, however, syenite is restricted by petrographers to rocks without quartz. Similarly named is 'tourmaline' granite. In spite of the exclusion of mica as a necessary constituent of granite by the rigorous definition of modern petrologists, it is still customary to call various micaless granites granulites, granitites, etc. When the crystal components of the rock are large and prominent to the eye the rock is called a porphyry; if the feldspar or quartz predominate, a feldspar or quartz porphyry respectively.

But porphyry is more generally used to describe the structure of any composite rock than as a designation of one kind. When the grains of the granite are so fine as to be indistinguishable the rock is commonly called a felsite, though it has been stated (see 'Feldspar') that the latest authorities use the word felsite as they use porphyry, to describe a condition of different igneous rocks rather than to designate a single variety. Some of the finest specimens of porphyry result from large crystals of feldspar or quartz imbedded in such a felsitic matrix.

While there are still differences of opinion among geologists as to the origin or origins of granite, von cotta considered it the type of the acidic plutonic rocks, i.e., a rock rich in silicic acid (or silica) which had been in a molten state and had cooled slowly and far below the earth's surface under great pressure. It is difficult to reconcile with this definition the extreme fineness of some of the veins of granite which have cut through overlying rocks in interlacing fine sheets. This would imply an almost perfect state of fluidity, and a thick superincumbent mass which once covered the present outcrops. Granite has, from the earliest times, been valued as a material for building and for monuments, and for the latter use especially the felsitic porphyry.

Some of the most celebrated localities from which granite has been obtained for buildings and monuments, in ancient and modern times, are Syene (upper Egypt), Aberdeen (Scotland), Dartmoor (Devonshire), Castlewellan (Ireland), Mt. Desert and the Maine Coast, Quincy, Mass., Richmond, Va., etc., (U. S.).

The value of the granite output of the U. S. in 1905, including trap and other igneous rocks, $20,637,693.

GRANIVOROUS, a. *grăn-ĭv'ŏ-rŭs* [L. *granum*, a grain or seed; *voro*, I devour]: living upon grains or other seeds.

GRANMICHELE. *grân-mē-kā'lā*, or GRAMMICHELE: town of Sicily, province of Catania, 30 m. s.w. from Catania, on a mountain ridge, 1,768 ft. above the sea.

Beautiful marbles are produced in the neighborhood. The town was founded in the end of the 17th c. by the Branciforte family, and peopled with the inhabitants of the neighboring town of Occhialà, which was destroyed by earthquake 1693. Pop. 12,000.

GRAN SASSO D'ITALIA, *grân sâs'sō dē-tâ'lē-â* ('Great Rock of Italy'), also called MONTE CORNO, from the resemblance to a horn which it presents on the east: highest summit of the Apennines, elevation 10,206 ft. It is on the borders of the Abruzzi, between Teramo and Aquila. It owes its name partly to its height, and partly to its being formed of a single mass of calcareous earth from its middle to its summit. It is seen to great advantage from the side of Teramo, where it is broken into tremendous precipices. The summit is covered with perpetual snow. Wolves, bears, and chamois abound on the mountain—the chamois being found on no other part of the Apennines. The general character of the scenery is more Alpine than Apennine, and in wild grandeur and variety it is not surpassed by any landscape in Italy. To the painter, geologist, and botanist it affords a rich field. See *Itinerary* of F. Caldane.

GRANT v. *grănt* [OF. *cranter*, to confer an advantage —from mid. L. *gratum*, consent; *grantum*, satisfaction: or OF. *craanter*, to assure—from L. *creden'tĭă*, trust, assurance]: to admit as true what has not been proved; to give or bestow something which cannot be claimed by right; to concede: N. the thing conferred on or conveyed to; an allowance; concession; admission; in *law*, the conveyance of real property by deed—now applied to estates corporeal as well as incorporeal. GRANT'ING, imp. GRANT'ED, pp. GRANT'ER, n. one who. GRANT'ABLE, a. *-ă-bl*, that may be granted. GRANTEE', n. *-tē'*, the person to whom anything is conveyed or granted. GRANTOR', n. *-tŏr'*, in *law*, one by whom a grant is made.—SYN. of 'grant, v.': to confer; give; convey; bestow; transfer; admit; allow; yield; cede.

GRANT: a generic term applied in civil law to all transfers of real estate.

GRANT, MRS. ANNE (Mrs. Grant of Laggan): miscellaneous writer: 1755, Feb. 21—1838, Nov. 7; b. Glasgow; daughter of a British officer named M'Vicar, who became barrack-master of Fort Augustus. She married the Rev. James Grant, chaplain of the fort, subsequently minister of Laggan. Left a widow in destitute circumstances, Mrs. Grant published by subscription a volume of *Poems* (1803) which were well received; 1806, *Letters from the Mountains*—a highly popular work; 1808, *Memoirs of an American Lady* (Mrs. Schuyler, with whom the author spent four years of her childhood in America); 1811, *Essays on the Superstitions of the Highlanders of Scotland*, etc. In 1825 Mrs. Grant received from government a pension of £100 a year.

GRANT, CHARLES, Lord GLENELG: 1779–1866; b. in India, at Kidderpore, presidency of Bengal; of a Highland family. The father of Lord Glenelg (also Charles Grant, 1746—1823) went early to India, represented for many years the county of Inverness in parliament; and was with Wilberforce, Thornton, Zachary, Macaulay, and others, a member of the Clapham sect, described by Sir James Stephen in *Ecclesiastical Essays*. Charles, the eldest son, took his degree M.A. 1804 at Magdalene College, Cambridge. He was called to the bar 1807, but never practiced. In 1811, he was elected M.P. for the Inverness district of burghs; and he continued in the house of commons for 25 years, and then was raised to the peerage. Grant was for five years a lord of the treasury; and in 1819–21 sec. for Ireland. As secretary for Ireland he sought conciliatory measures, such as suppressing the Orange demonstrations, securing impartial administration of justice, and devising a system of national education adapted for Rom. Catholics as well as Protestants. Grant was vice-pres. of the board of trade 1823–27; president of the board of control 1830-34; and sec. of state for the colonies 1834–39. He supported the liberal party by his vote. He died at Cannes, in France.

GRANT, Sir FRANCIS: 1803-1878, Oct. 5; b. Edinburgh; fourth son of Francis Grant of Kilgraston, Perthshire. He received his education at Harrow and at the University of Edinburgh, and it is said had in view the Scottish bar, but soon turned to follow his natural genius for painting. A noble portrait by Velasquez in Lord Elgin's gallery is said to have exercised especial influence over the young painter's art-career. His first picture at once gave him rank among the best portrait-painters of the day. His most famous works are those in which he has combined the likenesses of distinguished characters with scenes of English sport. The *Meet of H. M. Stag-hounds*, painted 1837 for Lord Chesterfield, containing 46 portraits (winning a gold medal at Paris 1855); the *Melton Hunt*, for the Duke of Wellington; and the *Cottesmore*, for Sir R. Sutton, are best known in this class. Other paintings were equestrian portraits of the Queen and Prince Consort for Christ's Hospital: the picture of the beautiful Marchioness of Waterford; and those of Lords Palmerston, Russell, Gough, Macaulay, Hardinge, etc. In 1842, Mr. Grant was elected assoc., 1851 academician, and 1866 pres. of the Royal Academy. Soon afterward he received, according to ancient precedent, the honor of knighthood. In 1870 he received the degree of D.C.L. from Oxford.

GRANT, FREDERICK DENT: soldier and diplomat; b. 1850, May 30, at St. Louis, Mo.; eldest son of Gen. U. S. Grant, (q.v.). Having entered the military academy at West Point, he was graduated in 1871 and assigned to the 4th cavalry. He served for some time as aide-

de-camp to Gen. Sheridan in the latter's Indian campaigns, and subsequently participated in the Black Hills expedition. In 1881 he resigned from the army with the rank of colonel. For several years he was engaged in business in the city of New York, and in 1888 he was appointed minister to Austria-Hungary, a position which he retained until 1893. In 1897 he was appointed a commissioner of police in the city of New York, under the administration of Mayor Strong, and on the outbreak of the war with Spain the following year he was commissioned colonel of the 144th New York volunteers. He was assigned to duty in Porto Rico, and the same year promoted to brig-gen. of volunteers. Subsequently he commanded the military district of San Juan, and was then transferred to the Philippine Islands, where he performed his most conspicuous service. He was almost constantly engaged in field movements of importance, and while in command on Samar island he received the surrender of the last of the insurgent forces. He became brig.-gen. in the regular service in 1901, and was promoted maj.-gen 1906, Feb. 7, and assigned to the command of the Eastern District with headquarters on Governor's Island, N. Y.

GRANT, George Munro: Canadian author: b. Albion Mines, N. S., 1835; d. 1903. He was educated at the University of Glasgow and from 1863 to 1877 was pastor of St. Matthew's Presbyterian Church, Halifax; appointed principal of Queen's College Kingston, 1877; became widely known as a powerful preacher, public speaker and enthusiastic Imperialist. His works include: *New Year Sermons* (1865–6); *Reformers of the 19th century* (1867); *Ocean to Ocean* (1873); (Edited) *Picturesque Canada* (1882); *Our Five Foreign Missions* (1887); *Advantages of Imperial Federation* (1887); *Our National Objects and Aims* (1890); *Canada and the Canadian Question* (1891); *Religions of the World in Relation to Christianity* (1894); *The Religions of the World* (1895).

GRANT, Robert, American author and judge: b. Boston, Mass., 1852, Jan. 24. He was graduated from Harvard in 1873 and the Harvard Law School in 1879, and has practiced law in his native city since 1879. He was one of the water commissioners of Boston 1888–93, and in the latter year became a judge of probate and insolvency for Suffolk County, Mass. He has published: *The Little Tin Gods on Wheels* (1879); *Confessions of a Frivolous Girl* (1880); *The Lambs*, verse (1882); *An Average Man* (1883); *Yankee Doodle, verse* (1883); *The Oldest School in America*, verse (1885); *The Knave of Hearts* (1885); *A Romantic Young Lady* (1886); *Face to Face* (1886); *Jack Hall* (1887); *Jack in the Bush* (1888); *Mrs. Harold Stagg* (1890); *The Carletons* (1891); *The Reflections of a Married Man* (1892); *The Opinions of a*

Philosopher (1893); *The Art of Living* (1895); *The Bachelor's Christmas* (1895); *Search Light Letters* (1899); *Unleavened Bread*, a novel which has been widely read (1900); *The Undercurrent* (1904); *The Orchid* (1905); etc. Since 1895 he has been an overseer of Harvard College.

GRANT, Ulysses Simpson (originally Hiram Ulysses), 18th president of the United States: 1822, Apr. 27—1885, July 23; b. Point Pleasant, Clermont co. Ohio. He was the oldest of six children of Jesse R. Grant and Hannah Simpson Grant, and spent his boyhood working on the farm and in the tannery of his father, and attending the village school. In 1839 he entered the U. S. Military Acad., where his name was erroneously entered as Ulysses S., the S. being supposed to represent his mother's family name. As the officials declined his request to correct the name he was forced to assume it and was thereafter known by it. He graduated 21st in a class of 39, was commissioned brevet 2d lieut. and assigned to the 4th U. S. infantry at Jefferson barracks 1843. In 1844 he went with his regt. to La.; 1845 was promoted 2d lieut. and joined Gen. Taylor's army of occupation in Mexico; 1846 took part in the battle of Palo Alto May 8, and Resaca de la Palma as commander of his company May 9, joined the army at Monterey, Mexico, Sep. 19 and performed several acts of heroism before that city; 1847 served through the siege of Vera Cruz, Mar., was in the battle of Cerro Gordo Apr. 17–18, entered Pueblo May 15, and took part in the capture of San Antonio and the battle of Churubusco Aug. 20, the battle of Molino del Rey Sep. 8, the storming of Chapultepec Sep. 13, the operations against Mexico City, and the occupation Sep. 14. He was promoted 1st lieut. 1847, Sep., remained with the troops in Mexico City till the withdrawal 1848, July, went with his regt. to Pascagoula, Miss., married Julia B. Dent 1848, Aug. 22, and served at Sackett's Harbor, N. Y., Detroit, Benecia Barracks, Cal., Fort Vancouver, Or., and Humboldt Bay, Cal., till 1854, July 31, when he resigned his captain's commission, and engaged in farming near St. Louis. His success was not financially great, and in 1860 he removed to Galena, Ill., and entered his father's hardware and leather store as clerk, and was so employed with very limited wages when the civil war broke out. Four days after Pres. Lincoln's first call for volunteers, Grant organized a company in Galena. He offered his services to the war dept., and failing to receive a response, drilled his co., took it to Springfield, Ill., where Gov. Yates engaged him to organize vol. troops, and he was commissioned col. of the 21st Ill. inf. 1861, June 17. In July he reported to Gen. Pope in Mo., Aug. 7, was appointed brig.-gen. of vols., and Sep. 1 was placed in command of the dist. of S. E. Mo., with head-quarters at Cairo. Without awaiting instructions, he entered at once upon an energetic cam-

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paign, and by his prompt seizure of Paducah (Sep. 6) saved Ky. to the Union. In Nov. he made a demonstration at Belmont to prevent the Confederates sending troops from Columbus to reinforce Gen. Sterling Price, then advancing into Mo.; and spent Dec. and Jan. (1862) planning and urging on the war dept. a joint army and naval expedition against Fort Henry on the Tenn. river. He received the desired orders Feb. 1, and in conjunction with Com. Andrew Hull Foote (q.v.) began the movement on the next day. (See DONELSON FORT.) For his victories at Forts Henry and Donelson—the first substantial victories on the national side—Grant was promoted maj.-gen. of vols. He proposed following up his advantage and started for Nashville Feb. 28, but was suddenly deprived of command and ordered to remain at Fort Henry. On Mar. 13 he was as suddenly restored to command, in consequence of the concentration of Confederate armies near Corinth, Miss., and was ordered to move up the Tenn. river toward the Confederate rendezvous, but not to attack. He established his lines near Shiloh, or Pittsburg Landing, and while awaiting the arrival of Gen. Buell's army was attacked by 50,000 Confederates from Corinth under Gen. Beauregard. The first attack Apr. 6, found Grant at a disadvantage on account of the distance of his supporting troops from his main body; but after Buell's arrival with 40,000 men both armies united, and Apr. 7 attacked the Confederates, drove them in retreat to Corinth, thwarted Beauregard's intention of overwhelming Grant, and held their ground. (See CORINTH, BATTLES OF.) After this victory Grant proposed an immediate movement against Vicksburg. After waiting in vain for orders he started without them Nov. 3. He seized Grand Junction, La Grange, Holly Springs, and Oxford, ordered Gen. Sherman to move down from Memphis to attack Vicksburg, and prepared to co-operate with him by land. The unfortunate surrender of Holly Springs, with its large stores, entirely frustrated his designs, and compelled him to abandon the campaign. In 1863, Jan., Grant took command of all the troops in the Miss. valley, and established himself at Memphis, preparatory to making another attempt on Vicksburg. Failing in several plans, he sent the gunboats and transports down the river past the batteries Apr. 16, 29, and threw his army across the river at Bruinsburg, 30 m. s. of Vicksburg, Apr. 30. Two Confederate armies opposed him, Pemberton's of 50,000 men at Vicksburg, and Johnston's of 43,000 at Jackson. On May 1 he defeated a portion of Pemberton's force at Port Gibson, May 12 routed part of Johnston's army, May 14th captured Jackson and scattered Johnston's army, May 16 defeated Pemberton at Champion Hill, May 17 defeated him again at Black River Bridge, and May 18 drove him into Vicksburg. He made unsuccessful assaults upon the city May 19, 22,

began siege operations May 23, and received the surrender of the stronghold with 31,600 prisoners and 172 cannon July 4. During the whole campaign the Confederates lost 40,000 prisoners, 12,000 in killed and wounded, and 8,000 by disease and straggling, while Grant lost a total of 8,873. The surrender of Port Hudson to Gen. Banks soon followed, and the Miss. river was thus opened its entire length. For his Vicksburg victory Grant was commissioned maj.gen. in the regular army, and Oct. 16 was placed in command of the military div. of the Miss. river, which included the armies of the Ohio, Cumberland, and Tennessee. Oct. 27 he gained the battle of Lookout Valley, and Nov. 23, 24, 25 those of Chattanooga. (See CHATTANOOGA, BATTLE OF.) The rank of lieut.gen. was revived by congress 1864, Feb. Grant was nominated for the office Mar. 1, confirmed Mar. 2, and given command of all the armies of the United States Mar. 17. He then determined to march against the army of N. Va. under Gen. Lee, while his subordinates operated against the remaining Confederate armies. He ordered Gen. Sherman to move against Atlanta, Gen. Banks against Mobile, Gen. Butler up the James river toward Richmond, Gen. Sigel to penetrate the valley of Va., and Gen. Meade with the army of the Potomac to cover Washington. All the armies moved at the same hour on May 4. Grant personally crossed the Rapidan, encountered Gen. Lee in the Wilderness, and fought a desperate series of battles May 5, 6, 7. After the battles of the Wilderness came those of Spottsylvania, North Anna, and Cold Harbor, and by the time Grant reached the James river he had lost 6,000 killed, 26,000 wounded, and nearly 7,000 missing. (See COLD HARBOR, BATTLE OF; CHICKAHOMINY, BATTLE OF.) June 13, 14, 15, 16, Grant threw his army across the James river to operate against Petersburg and Richmond, and established his headquarters at City Point. Assaults were made on Petersburg June 15, 16, 17, 18, and important outworks were captured. Gen. Sheridan, by a series of bold cavalry raids, drove the enemy from the valley of Va., and other generals kept the subordinate Confederate armies so occupied that they could render Gen. Lee no assistance, while Grant succeeded in so surrounding and harassing Gen. Lee and threatening Richmond that the Confederate chief could spare neither man nor gun to the generals hard-pressed elsewhere. During the remainder of 1864 the Confederate Gen. Early made a dash for Washington (July 11), but in the face of the 6th corps hurriedly sent to its relief did not attack: Sheridan routed Early at Winchester (Sep. 19); Butler took Fort Harrison at Deep Bottom (Sep. 29), and held it against attempts to retake it; Meade gained important advantages on the line of the Weldon railroad (Oct. 1, 2); Sheridan turned defeat into victory over Early at Cedar Creek (Oct. 19); and

Butler made an unsuccessful attempt to capture Fort Fisher (Dec. 25). The capture of Fort Fisher by the army and navy 1865, Jan. 15, the defeat of Early by Sheridan at Waynesboro Mar. 2, and the great victory of Sheridan at Five Forks, Apr. 1 (see FIVE FORKS, BATTLE OF), created for Grant the opportune moment for the final campaign of the war. He had an aggregate force of 110,000 men before Petersburg and Richmond, and Gen. Lee had 73,000 men at Richmond and a militia and gunboat force of 5,000 more. Grant assaulted Petersburg at daylight Apr. 2, secured Forts Gregg and Whitworth in the afternoon, and occupied the city at night. Richmond surrendered the next day, Lee fled toward Lynchburg, but was surrounded at Appomattox Court-house, and forced to surrender Apr. 9. Johnston surrendered to Sherman Apr. 26. Mobile was evacuated Apr. 11, Macon surrendered Apr. 21, and Gen. Kirby Smith surrendered his army w. of the Miss., Apr. 26. Thus was the war closed. Honors without precedent were bestowed upon Grant. Congress created for him the grade of general, and swords and residences were presented him by corporations and private citizens. But he was not destined to enjoy the leisure his prowess had won. The assassination of President Lincoln entailed upon Grant a conflict with the successor to the presidency, Andrew Johnson. He was sec. of war in President Johnson's cabinet 1867, Aug. 12—1868, Jan. 14; elected pres. of the United States as a republican 1868; and was re-elected 1872. At the close of his second term he set out on a tour of the world, leaving Philadelphia 1877, May 17, and returning to San Francisco 1879, Sep. 20. During this trip he was the recipient of the most distinguished honors from the royal and imperial families of the old world. In 1880 he extended his pleasure trip to Cuba and Mexico. At the national republican convention in Chicago 1880, June, his name was presented as candidate for a third presidential term, and under the leadership of Roscoe Conkling (q.v.) the delegates gave him 302—313 votes on 36 successive ballots, but ultimately nominated Gen. James A. Garfield (q.v.). In 1881 he made his permanent winter residence in New York, retaining his cottage at Long Branch for summer use; 1882 was appointed a commissioner to negotiate a commercial treaty with Mexico, and became interested in the railroad development of that country; 1884 was bankrupted by the failure of the firm of Grant and Ward, in whose banking business he had invested all his capital, leaving the management of the business entirely to Ferdinand Ward; and in the summer of the same year a cancer appeared at the root of his tongue. He raised money by the sacrifice of his war swords, uniforms, testimonial swords, plate, rich caskets, and other articles presented him while on his trip round the world, and then, with failing strength, heroically

began writing his memoirs to provide means of supporting his family. In 1885, Mar. 4, congress passed a bill placing him on the retired list of the army with the rank and pay of general. In June following he was removed to Mt. McGregor, near Saratoga, N. Y., where he continued work on his memoirs, while his strength rapidly failed. He finished the proof-reading of his book four days before his death, and was conscious to the last. Imposing funeral ceremonies were held in New York Aug. 8, and the remains were placed in a temporary tomb erected in Riverside Park, overlooking the Hudson river. He wrote *An Undeserved Stigma* (as an act of justice to Gen. Fitz John Porter) in the *North American Review* (1882, Dec.), and *Personal Memoirs of U. S. Grant*, 2 vols. (New York 1885–6). He was a man of simple habits, great force of character, determined will, and great pertinacity; remorseless in war, most magnanimous in peace; exceedingly modest and unassuming, and of singular purity of character.

The remains of Gen. Grant now rest in a splendid granite mausoleum, reared by private subscription at a cost of $600,000, near the spot of his first entombment, the body being sealed in a sarcophagus of red porphyry. The formal presentation of the mausoleum to the city of New York, 1897, Apr. 27, was the occasion of an unprecedented ceremonial, more than half a million visitors being in the city. The summit of the structure is 150 ft. above the ground. The crypt consists of an open circular passage set off by massive square pillars from a central space within which, on a raised square granite platform, stands the sarcophagus.

GRANTS PASS, Ore., city, county-seat of Josephine County; on the Rogue River and on the Southern P. R.R.; in the southeastern part of the State, about 60 miles from the Pacific. It is the commercial centre of an agricultural, lumbering, and mining region; and its chief manufactures are lumber, flour, wood products, machinery for the farms, mines, and for lumbering, and bricks. It has large railroad repair shops. Pop. 2,330.

GRANULA'TION TISSUE, the tissue formed in wounds to repair loss of substance. Through the clot in a fresh wound certain cells of the blood wander and begin to form new tissue. Blood vessels in tiny loops pass out from the sides of the wound. On the surface these loops form small rounded elevations, spoken of as 'granulations.' As the process goes on, the new tissue contracts, drawing in the sides of the wound; the skin grows out in delicate points from the margins of the cut. If the granulations pass beyond the surface-line because of irritation, they are spoken of as 'superfluous' granulations or 'proud flesh.'

GRANVILLE, *grâng-vēl′:* fortified town and seaport of France, department of La Manche, on a promontory surmounted by a fort, 23 m. n.e. of St. Malo. It is a badly built and uninteresting town; the extensive new pier, built with strength to admit of its being mounted with cannon, and the old parish church of gray granite, being almost the only noteworthy features. Its roomy harbor is well sheltered, but dry at low water. The principal trade of Granville is in whale, cod, and oyster fisheries. Pop. about 12,000.

GRANVILLE, *grăn′vĭl,* The Right Honorable GRANVILLE GEORGE LEVESON-GOWER, Earl, K.G., D.C.L., F.R.S.: b. London, 1815, May 11; d. 1891, Mar. 31; eldest son of the first Earl Granville. He was educated at Eton and Christ Church, Oxford, where he took his degree 1834, entered political life as attaché to the British embassy at Paris 1835, was elected M.P. 1836,7, became under-sec. of state for foreign affairs 1840, succeeded to the peerage 1846, was appointed vice-pres. of the board of trade 1848, entered the cabinet 1851 and Dec. succeeded Lord Palmerston in the foreign office, retiring early in 1852. He then became paymaster gen. of the forces, chancellor of the duchy of Lancaster, treas. of the navy, vice-pres. of the royal commission for the great exhibition 1850, pres. of the council 1853, ministerial leader in the house of lords 1855, pres. of the council 1859–66, chairman of the great exhibition commission 1862, and lord warden of the Cinque Ports 1865. He was colonial sec. under Gladstone 1868–70, and sec. for foreign affairs 1870–74, again became sec. for foreign affairs under Gladstone 1880, and was his sec. of state for the colonies 1886.

GRAPE, n. *grāp* [F. *grappe;* It. *grappo,* a grappling or clutching, a cluster or bunch of grapes: It. *grappa,* the stalk of fruit: Gael. *gràp;* Ir. *grapain,* to climb or clamber as the vine—*lit.,* the fruit-bearing plant which clambers]: the fruit of the vine; a single berry (see VINE). GRA′PY, a. *-pĭ,* like grapes, or made of grapes; full of clusters of grapes. GRAPE′LESS, a. without grapes. GRAPE-SHOT, see below. GRAPESTONE, n. the seed of the grape. GRAPE-SUGAR, a variety of sugar obtained principally from fruits, forming also the basis of honey, and often called *sugar of fruits, sugar of starch,* or *glucose* (see SUGAR: GLUCOSE). GRAPERY, n. *grā′pĕr-ĭ,* a place where grapes are grown: see VINE. GRAPE-FRUIT, the Shaddock (q.v.).

GRAPE HY′ACINTH (*Muscári*): genus of bulbous-rooted plants, of nat. ord. *Liliaceæ,* nearly allied to the hyacinths, but differing in the globose or subcylindrical perianth, contracted at the mouth, and 6-toothed. The species are natives chiefly of countries near the Mediterranean, and warmer temperate parts of Asia. Some of them are frequent in flower-borders in more northern countries. *M. moschatum* has a smell of musk. The flowers of the grape hyacinth mostly are blue.

GRAPE-SHOT, or TIER-SHOT: shot fired in clusters; bullets or small iron balls piled round an iron pin which holds together a series of parallel iron plates (each the diameter of the cannon used), between which plates are the shot, kept in their places by holes in the plates. Small 3½-inch or 4-inch shells are also quilted together like grape for firing from mortars at short range, e.g. in clearing the covert-way of a fortress from the third parallel. In either case, the explosion of the charge bursts asunder the binding, and the shot (or shells) begin to scatter directly on leaving the muzzle of the piece. Grape shot are very formidable against dense masses of troops, but only at comparatively short range. The shot employed differ in weight from 6 oz. to 4 lbs., according to the calibre of the gun from which they are fired. See CARTRIDGE.

GRAPE SUGAR. See GLUCOSE.

GRAPHIC, a. *grăf'ĭk*, or GRAPH'ICAL, a. *-ĭ-kăl* [Gr. *graphō*, I write: Gr. *graphĭkŏs;* L. *graphĭcŭs*, done to the life: F. *graphique*, graphic]: well delineated; described with accuracy; lifelike; having the appearance of writing, as *graphic granite*. GRAPH'ICALLY, ad. *-lĭ*.

GRAPHIC STATICS: the graphical methods employed for ascertaining the strains on structures, velocity ratios, etc., by means of lines drawn to an uniform scale and representing the direction and intensity of active forces.

GRAPH'IS [Gr. *graphō*, I write]: genus of lichens, which gives its name to a tribe, *Graphideæ*, remarkable for the resemblance which the fructification (*apotheeia*, or *shields*) assumes to the forms of the letters of oriental alphabets. Hence, some of these little plants have received such names as *Scripture-wort*. As some of the *Graphideæ* are found only on the bark of particular species of *Cinchona*, they guide to the identification of very valuable barks.

GRAPHITE, n. *grăf'ĭt* [Gr. *graphō*, I write]: a form of the element carbon (q.v.). Graphite is manufactured in large quantities at Niagara Falls from the ordinary forms of amorphous carbon, much anthracite coal being converted into this product. GRAPH'OLITE, n. *-ō-līt* [Gr. *lithos*, a stone]: a sort of slate suitable for writing on.

GRAPHOLOGY, *grăf-ŏl'o-jĭ*, [*graphē*, a writing, *logia*, a discourse]: the greater number of dictionaries and encyclopædias do not contain this word. Webster and Murray (the latter as the second of three meanings) define it as the art of inferring a writer's character, disposition, and aptitude from the peculiarities of his writing. The evolution of the word appears to have been through 'Graphiology,' which according to the last of the above authorities was a word coined by the advertising practi-

tioners of the art about 1850, but to which there are lexicographical objections. Its first and general meaning is the study of handwriting; and its third (used by Sylvester in the *Journal of Mathematics* in 1878, is 'a system of graphic formulas'; but the second meaning, implying an occult art, is that which is generally understood. This meaning makes of it an art of divination like astrology, chiromancy, and the sacrifices of the early religions where future events or present conditions were assumed to be marked by the phenomena presented by the organs of the body of the victim.

In fact Professor Binet, who has subjected the work of graphologists to rigorous scientific examination of which the results appeared in his *Révélations de l'écriture d'après un controle scientifique*, commenced with Graphology the series of scientific investigations which were designed to ultimately cover Graphology, Phrenology, and Chiromancy.

That there is a direct relation between the brain which conceives and the hand which executes certain conventional signs, must have occurred to many persons from the earliest times, and it is therefore most difficult to ascertain who first conceived the notion of consulting these signs as an oracle. The best authority gives the Italian philosopher Baldo, in his *Trattato come de una littera missiva cognoscano la natura e qualita delle scrittore* (1622). Eminent German authority credits John Caspar Lavater, inspired by Goethe, with the creation of this art in one of the 'fragments' of his book, *Physiognomische Fragmente zur Beförderung der Menschenkentniss und Menschenliebe*, published in 1777 (pp. 110–114). Accompanying the book are five plates containing 17 specimens of handwriting.

Cagliostro (b. 1743; d. 1795) used this mystification along with his many others. E. Hocquart in 1812, and Henze in 1862 returned to it; but French authority ascribes to the abbé Michon in 1869 the formal re-creation of the practice which was still more firmly established in 1893 by Crépieux-Jamin.

It seems now to be recognized as a legitimate profession by both French and German courts of law. Of the five experts in handwriting inscribed in the tribunal of the Seine in 1898 one was an adept in graphology. In Germany Drs. W. Preyer & A. Erlenmeyer, and W. Langenbruch, the last a sworn handwriting expert of the Court, collaborated in a monthly journal *Die Handschrift* (Handwriting) 'pages for scientific study of writing and Graphology,' in 1895. In the same year Dr. Preyer published *Psychologie des Schreibens.*

Without prejudging the claim of Graphology to a place among legitimate professions it is fair to sum up the results of the exhaustive and careful researches of Prof. Binet, who himself is a friendly critic, which here follow.

Its admissibility as testimony in Courts of law he thinks depends upon whether testimony involving a probable

error of one tenth is acceptable: i. e. if conclusions based upod this method were correct in not more than ninety per cent. of the cases.

In the experiments on graphological determination of age Dr. Binet concludes there is no evidence of the power of deducing, though there are evidences of 'intuitive' perceptions of age, which, with the best expert, and for all ages of the subject from 6 upwards, may amount to as little as 12 per cent. Graphic signs of intelligence exist but are not found in all intelligences. Graphological reasoning may establish two diametrically opposite conclusions. Some graphologists can read intelligence in handwriting, but hardly degrees of intelligence. There is some truth in graphology, as in phrenology (cephelometrie), and necromancy, but the graphologist's method is not infallible. It is intuitive; one does not reason, but affirms. Generally that which is affirmed with insistence is doubtful. (See HANDWRITING, STUDY OF.)

Bibliography.—Crepieux-Jamin J., *Handwriting and Expression* (1892); Meyer, Laura V. Albertini, *Lehrbueh der Graphologie* (2d ed. eng. 1900); Robinson, H. L., and M. L., *Talks on graphology*, etc. (1892); Frith, Henry, *How to read eharaeter in handwriting;* Michon, J. H., *Methode pratique de graphologie* (3d ed. 1885); Lumley, E., *Judging handwriting* (London 16 mo. 176 pp.); Baughn, *Charaeter indieated in handwriting* (London 8 vo.); Binet, Alfred, *Les Revélations de l'éeriture d'après un eontrole seientifique* (Paris 1906); Frazer, *English digest and review of the above* (*Science*, 1906, Oct. 5).

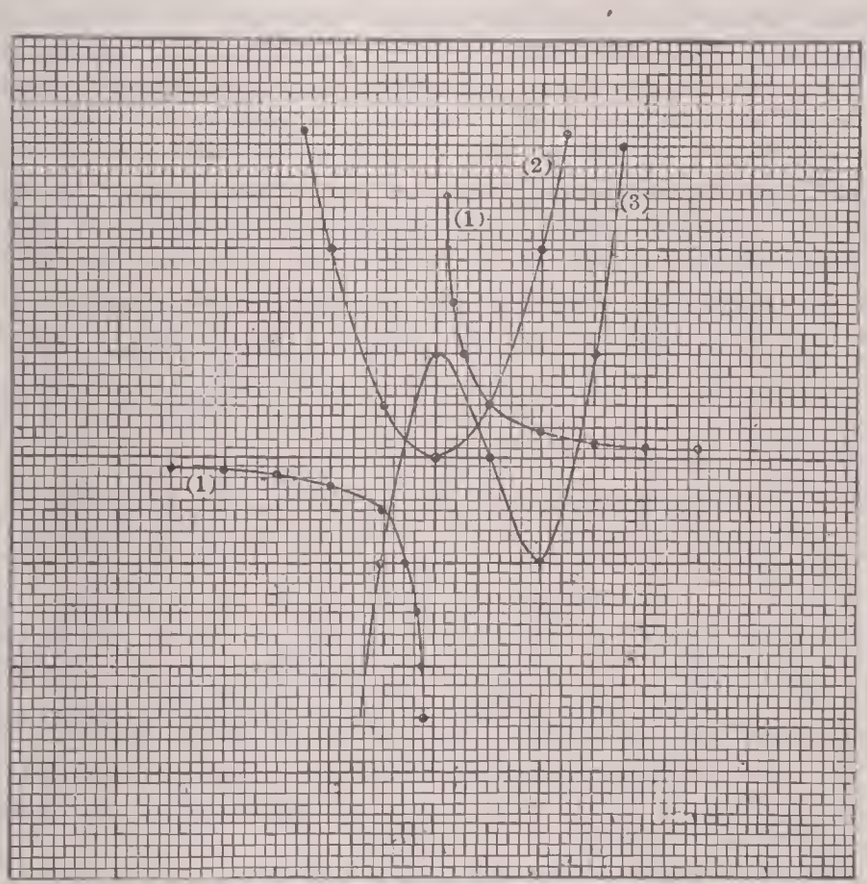
GRAPHOMETER, n. *grăf-ŏm'ĕ-tėr* [Gr. *graphō*, I write; *metron*, a measure]: mathematical instrument for measuring angles, called also a *semieirele;* properly called PROTRACTOR (q. v.). GRAPH'OMET'RICAL, a *-mĕt'rĭ-kăl*, pertaining to or ascertained by a graphometer.

GRAPHOPHONE, *grăf'o-fōn:* apparatus for reproducing speech; invented by Charles Sumner Tainter, 1886. It is constructed on the same general plan as the phonograph, (q.v.).

GRAPHOTYPE, n. *grăf'ō-tīp* [Gr. *graphō*, I write; *tupos*, a type]: one among numerous modes of producing an engraved picture-surface from which printing can be effected by the ordinary press; intended as a cheap substitute for engraved wood-blocks in illustrations for books. The principle is, sketching the design on a chalky surface, and brushing away the chalk from between the lines. In later forms of the process. invented 1860 by an American wood engraver DeW. C. Hitchcock, the block is superseded by a zinc plate with finely-pounded French chalk, brought to a hard and very fine texture by enormous pressure, with a glossy surface produced by an interposed steel plate. On this white surface, sized and dried, the picture is drawn with camel or sable hair pencils, dipped in an ink made of

glue and lampblack. When dry, the white or uninked portions are rubbed down by means of a small fitch-hair brush, and pads covered with silk velvet. The rubbing is continued until the white is sunk sufficiently below the level of the inked picture or design. The plate is then saturated with liquid glass or silicate of soda, which converts the French chalk into a kind of marble. An electrotype of this is then taken to be printed from.

GRAPHS, in Mathematics: curves representing geometrically the relation between two varying quantities. They are conveniently plotted on coordinate paper, which is ruled in small squares. Two of the lines, at



right angles to each other, are chosen as axes of reference. From their intersection (the *origin*) the one quantity x is laid off on the one line, and from its extremity the other quantity y is laid off parallel to the other line. The point P at the extremity of y represents the pair of values x, y, and describes the required graph as x and y vary subject to the law connecting them. This law may be given in the form of an equation between x and y, in which case the graph is simply the *locus* of the equation. Or the values of y may be given only for values of x at certain intervals; for example x may represent the number of years, beginning say with 1900, and y the population of New York City at the end of each year. In such a case, the available data give only

detached points of the graph, which may be roughly completed by connecting each pair of successive points by a straight line, or by drawing a smooth curve through them. In laying off the points positive values of x and y are measured to the right and upward, negative values to the left or downward (see COORDINATES). Graphs are constantly used by engineers, physicists, etc., for example, the indicator diagram of a steam engine is the graph showing the relation between the pressure and volume of the steam in the cylinder. In pure mathematics graphs are used to represent equations and bring out their properties in visual form.

The Fig. shows the graphs of (1) $y=x^2$, (2) $y=1/x$, (3) $y=x^3-3x^2+2$. In each case 5 of the small lengths on the paper are taken as unit of length. To obtain the upper and lower turning points (maxima and minima) of a curve like that for $y=x^3-3x^2+2$, for example, we multiply each term on the right of the equation by its exponent, diminish the exponent by 1, and set the resulting expression equal to 0. This gives in the present example $3x^2-6x=0$, from which we find $x=0$ or 2 and finally $y=2$ or -2.

GRAPNEL, n. *grăp'nĕl* [F. *grappin;* OF. *grappil*, the grapple of a ship—from *grappe*, a hook]: small anchor with four or five flukes or claws, used to hold boats or small vessels; a grappling-iron; also GRAP'LINE, or GRAP'LING, n.. See GRAPPLING-IRON.

GRAPPLE, v. *grăp'pl* [OF. *grappil*, the grapple of a ship; It. *grappare*, to clutch, to grapple: Sw., *grabba*, to grasp: Dut. *grabbelen*, to seize greedily]: to seize; to lay fast hold of; to contend in close fight, as wrestlers: N. a seizing firmly, a wrestler's hold; a close fight; an iron instrument by which one ship fastens on another. GRAPPLING, imp. *grăp'plĭng:* ADJ. catching as a grapple. GRAPPLED, pp. *grăp'pld.* To GRAPPLE WITH, to contend with; to struggle against boldly. GRAPPLING-IRONS, small grapnels formerly used in sea-battles to bring hostile ships together for boarding.

GRAP'PLE-PLANT (*Uncaria procumbens*): procumbent plant of the same genus with the gambir (q.v.), native of s. Africa. The seed-vessel has many hooked thorns and clings most tenaciously to any animal—a provision for the distribution of the seed. When it lays hold of the mouth of an ox, Livingstone says, the animal stands and roars with pain and a sense of helplessness.

GRAPTOLITES, n. plu. *grăp'tō-līts* [Gr. *graptos*, written; *lithos*, a stone]: in *geol.*, fossil zoophytes probably akin to the sertularians of modern seas, found throughout the Silurian deposits; also GRAP'TOLITH'US, n. *-tō-lĭth'ŭs.* GRAP'TOLIT'IDÆ, n. plu. *-lĭt'ĭ-dē*, an extinct subclass of the Hydrozoa.

GRAP'TOLITES: group of fossil zoophytes, apparently nearly related to the recent sertularia. They had simple

or branched polypidoms, formed of a horny substance. The cells in which the polyp lived were arranged in a single series on one side of the rachis, or in a double series on both sides; the rachis was generally prolonged beyond the cells at the growing end of the polypidom. Egg capsules have been observed attached to the polypidom, exhibiting a method of reproduction similar to that in the hydroid zoophytes. The generic division of the graptolites has been based on the arrangement of the cells. Nearly 80 species have been described; confined to the Silurian strata, and most abundant in the hard slaty shales, which were the fine mud of the Silurian seas.

GRAPY. See GRAPE.

GRAS, FELIX: Provençal writer: b. Malemont, near Avignon, 1844, May 3; d. Avignon, 1901, March 4. His education ceased at 17, when he returned to his father's farm, from which he was sent, in 1864, to Avignon and articled to Jules Giéia, a man of letters as well as a lawyer, and a member of Félibrige, a Provençal literary club of which Frederic Mistral was a member. Amid such surroundings he accepted law as his profession but resolved on literature as his vocation. In 1876 he published his first important work, an epic poem in 12 cantos, *Li Carboumie*, which won for him the first place among Provençal writers of the younger generation. *Toloza*, an epic recounting the crusade of Simon de Montfort against the Albigenses, followed in 1882. He proved himself second only to Mistral among Meridionals by a collection of his shorter poems to which he gave the title *Lou Roumancers Prouvençal* (1887). In his collections of prose stories, *La Papalmo* (1891), he fancifully describes, in vivid, racy style, the loves and hates, sensuality and 'superstition' of the papal court at Avignon. His greatest popular success, *Li Rouge, dóu Miejour* (1896), was published in a translation, *The Reds of the Midi*, before it saw the light in France, where it is not so popular as among those who read the English version alone. A more recent work, which has been translated in the United States under the title *The White Terror*, describes the retaliatory violence of the Royalists in the south, when the storm of the Revolution had swept by. For 10 years previous to his death he had been Capoulié, or president of the Félibrige.

GRASLITZ, or GRASSLITZ, *grâs'lĭts:* small town of Bohemia, on the border of Saxony, 20 m. n.n.e. of the town of Eger. It has manufactures of cotton-goods, paper, looking-glasses, musical and mathematical instruments, and machinery. It has a handsome church, built 1618; and is the headquarters of a military district. Pop. about 9,000.

GRASMERE, *grăs'mēr:* village and lake in Westmoreland, England, about three m. n.w. of Ambleside. The village, beautifully situated at the head of the lake, has

an ancient church, containing Wordsworth's grave, which is marked by a plain and modestly-fashioned slab. The lake is more than a mile long, and about half a mile broad, is oval in form, and incloses a small island. It is girdled about by high mountains, and forms one of the most beautiful scenes in England. Pop. about 600.

GRASP, n. *grăsp* [Ger. *grappsen*, to grope: It. *grasspare*, to grasp: Pol. *grabki*, a fork: connected with GRIPE and GRAB]: the grip or seizure of the hand: hold or possession; power of seizing: V. to grip or seize the hand: to catch at; to lay hold of greedily; to encroach. GRASP'ING, imp. ADJ. covetous; rapacious: N. seizure; attempt to seize. GRASPED, pp. *grăspt*. GRASP'ER, n. one who. GRASP'ABLE, a. *-ă-bl*, capable of being grasped. GRASP'INGLY, ad. *-lĭ*. TO GRASP AT, to try to seize; to catch at.

GRASS, n. *grăs* [AS. *græs;* Dut. *gras*, grass: Norw. *gras*, applied to every green herb; Dut. *groese*, growth: prob. from same root as Lat. *cresco*, Eng. *grow*]: field or hill pasture; herbage; the plants having simple leaves, jointed and tubular stems, etc. (see GRASSES): V. to cover with turf or herbage. GRAS'SING, imp. GRASSED, pp. *grăst*. GRAS'SY, a. *-sĭ*, covered with grass; green with grass. GRAS'SINESS, n. GRASS'LESS, a. wanting grass. GRASS-GREEN, green like grass. GRASS-GROWN, grown over with grass. GRASS-PLOT, level spot covered with grass. GRASS-WIDOW, *slang*, a wife whose husband is compelled by his duties to live abroad for a long time, and away from her; a woman living apart from her husband; a woman from whom her husband has run away, and she knows not whether he be alive or dead. GONE TO GRASS, *colloq.* dead.

GRASS'CLOTH: popular though erroneous name of certain beautiful fabrics manufactured in the East from different kinds of fibres, none of which are produced by grasses. One of these fabrics is made from the fibre of *Bœhmeria nivea*, popularly called China-grass; another known as *pina muslin*, from the fibre of *Bromelia Pigna*. See BOEHMERIA and BROMELIACEÆ. The kinds of cloth really made from the fibre of grasses are extremely coarse.

GRASSE, *grâs:* manufacturing town of France, dept. of Alpes-Maritimes, in the midst of flower-gardens, on the s. slope of a hill 23 m. e.n.e. of Draguignan. The streets are steep, narrow, and crooked, but the houses are well built. The principal buildings are the college, hosiptal, and ecclesiastical school. Grasse is second only to Paris in its manufactures of essences and perfumes, made from the roses, orange-flowers, heliotropes, mint, etc., which, from the mildness of the climate, are successfully grown in the vicinity. It has also manufactures of woolen goods, soap, leather, and olive oil; and there are several silk-spinning factories and some

tanneries; and considerable trade in oranges, citrons, wax, and honey. Pop. about 15,000.

GRASSE, *grâs:* Francois Joseph Paul de, Count, and Marquis de Grasse-Tilly: 1723–1788, Jan. 11; b. Provence, France: admiral. He entered the navy at an early age, served against the Moors and Turks, and was promoted lieut. 1754, capt. 1762, rear-admiral 1778, and chief of squadron 1779. In 1781 he was appointed commander of a fleet fitted out by France to aid the Americans in the war with England, and sailed Apr. 13 with 29 ships and 3,000 troops. He eluded the British fleet, blockaded the York and James rivers, took part in the siege and capture of Yorktown, and with Rochambeau received the special thanks of congress. After the war he re-established the naval power of France in the W. Indies, where for a time he was successful against the British, capturing the island of St. Christopher; but on 1782, April 12, was surprised by the English fleet under Rodney, and after a hard fight defeated, and taken prisoner. He was accused of carelessness and even treachery, but was exonerated by an official investigation, and at the time of his death held the rank of lieutenant-general of the naval forces of France.

GRASSES (*Gramineæ* or *Graminaceæ*): the most important family of the monocotyledonous plants, and with the sedges constituting the natural order of the Graminales. The grasses number over 3,500 species and are grouped in more than 300 genera. They are exceeded in number of species by both Orchids and Composits, but in number of *individuals* they occupy first rank, indicating that they have been eminently successful in competition with other plants in the struggle for existence.

Grasses have taken possession of all parts of the earth's surface; certain species are characteristic of the tropics, while others find their favorable habitat in the vicinity of perpetual snow. They however attain their greatest luxuriance in the temperate regions, where they form the principal vegetation of the natural meadows and plains formations. Grasses grow on all kinds of soil, even the poorest having its characteristic species. Some species are so constantly associated with certain soil types that they may be used as *indicators* of the kind of soil, for example, lime soils, salt soils, sour soils, etc. Many species are xerophytic, adapting themselves to dry, sterile, sandy soils of hills and plains; others are halophytes, thriving in salty soils, and may be called maritime or seaside grasses. A considerable number are hydrophytes and flourish only in marshes, stagnant water or slow streams, while our meadow and pasture grasses and most of the cultivated cereals are characteristic of mesophytic conditions. Some species are ruderal or vagabond, being able to adapt themselves to various conditions of soil or moisture. Some species are shade forms, while the majority are tolerant to intense illumination.

GRASSES.

Grasses, like other plants, may be annual, biennial or perennial, and while this character is generally constant it may vary according to conditions. When a grass seed germinates, a primary or tap root is produced, but this soon dies and is succeeded by numerous adventitious fibrous roots which originate from the basal nodes of the stem. These roots may be entirely underground or they may be partially above ground, as in the brace roots of Indian corn.

The aerial stems (culms) are generally cylindrical, sometimes flattened, but never triangular; they are generally hollow except at the joints or nodes (Andropogon, Zea, Sorghum, etc., are solid); grass stems generally do not branch except at the base; the branch buds develop

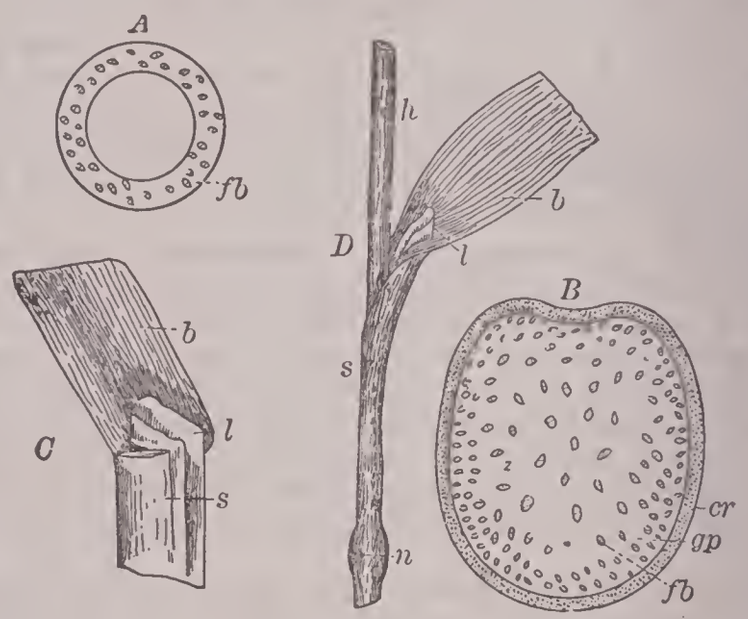


Fig. 1.

A, Diagram of a cross section of a hollow grass stem (culm); *fb*, fibrovascular bundle; *B*, Diagram of a solid stem (Zea mays); *cr*, primary cortex; *gp*, ground parenchyma; *fb*, fibrovascular bundle; *C*, portion of a leaf to show parts; *D*, portion of a leaf to show parts and relation to each other; *b*, leaf blade; *l*, ligule; *s*, leaf sheath; *h*, halm or culm; *n*, slightly enlarged node covered by the sheath.

in the axils of the leaves and may remain intra-vaginal, producing close tufts, or the shoots may burst through the leaf sheaths, thus becoming extra-vaginal. Extra-vaginal, shoots may run horizontally either above or below ground, in the form of runners or stolons and cause the rapid spread of the grass. The underground stems or rhizomes are often called 'creeping roots.' All perennial grasses produce underground stems, and these may be very short and condensed or even bulbous, while in many cases they are elongated and very evident. The great majority of grasses produce aerial stems three feet or less in height, a less number exceed three feet, while a few, the bamboos, attain the height and magnitude of trees.

The leaves of grasses consist of two well-differentiated parts: the more or less elongated, parallel-veined blade (occasionally lacking) and the sheath or basal part which surrounds the stem and springs from a node. The sheath is apparently split and wrapped around the culm, only partially split, or quite entire, when it forms a closed cylindrical vagina. Grass leaves are always alternate and many are so constructed that they roll up with loss of water and thus prevent or retard transpiration. Most

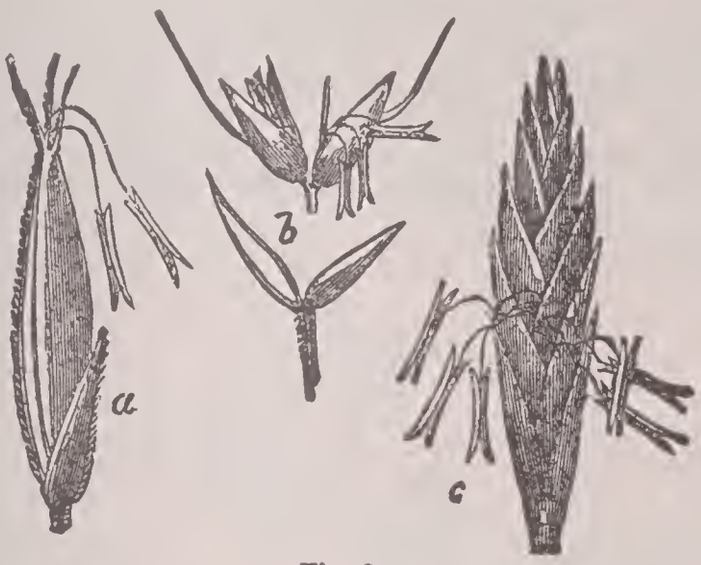


Fig. 2.

a, spikelet with one flower showing the two stamens; *b*, spikelet with two flowers shown detached from the glumes; *c*, spikelet with many flowers. Flowers of *b* and *c* have three stamens, the typical number.

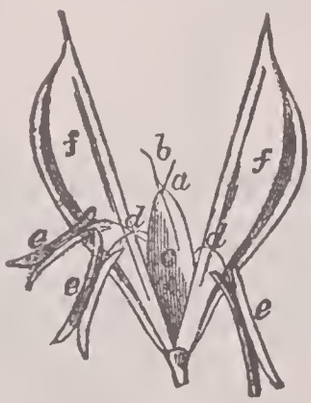


Fig. 3—Spikelet with one flower.

a, the pistil; *b*, stigmas; *c*, ovary; *d*, filaments of the stamens; *e*, anthers; *f*, glumes.

grasses have at the junction of sheath and blade a delicate upgrowth, the *ligule*, closely oppressed to the stem. This is generally membranous, but in some cases consists of a tuft of hairs.

The flowers of grasses are generally perfect—containing both stamens and pistil, but they may be monœcious (Zea, Tripascum) or diœcious (Distichlis spicata, etc.). The flowers with their accessory parts are grouped in clusters called spikelets (one or more flowers) and these in turn are arranged in spikate, racemose or paniculate

inflorescences. A spikelet generally consists of a central axis bearing two basal scales, the lower and upper *glumes*, and one or more fertile scales (*lower palet* or *flowering glume*) bearing flowers in their axils. A scale-like bract, the *upper palet*, and the lower palet inclose the flower which consists of the *pistil*, one or more whorls of *stamens* and one or more (generally two) rudimentary scale-like structures called *lodicules*. The pistil consists of an enlarged basal portion, the *ovary*, bearing one to three plumose or hairy *stigmas* (generally two). The simple one-celled, one-ovuled ovary develops after fertilization into the seed-like fruit, the *caryopsis*, popularly called the 'seed.' The stamens are always hypogenous and generally three in number (sometimes one or even six or more), with versatile anthers. The lodicules are

Fig. 4—Diagram of a grass spikelet.

g^1, lower and g^2 upper glume; *a*, axis of the spikelet; *P*, lower and *p*, upper palet of the middle flower; *L*, lodicule; *s*, stigmas; *an*, anthers of the stamens; *o*, ovary; *b*, barren flower represented by a naked axis. All parts of the axis are represented as elongated in order to show their relation to each other.

either rudimentary perianth divisions or minute bracteoles of no significance in the flower. Functionally they may aid in the separation of the paleæ by swelling up at the period of anthesis, thus permitting the exposure of stamens and stigmas. The flowers are anemophilous, that is, they are wind pollinated, or sometimes self-fertile. In a few grasses the flowers or even entire spikelets may be transformed into minute leafy buds or *bulbils*, which drop from the inflorescence and function as organs of propagation (Poa alpina, Festuca ovina, etc.).

The fruit of grasses is a *caryopsis*, that is, the ovary wall and the seed are closely adherent. The embryo is provided with an abundant supply of carbohydrate reserve food in the form of a starchy endosperm which constitutes the bulk of the seed, especially in the cereals. The name

seed as employed by the farmer or seedsman may mean the caryopsis alone (wheat, rye, etc.) or it may mean the true fruit or grain with adherent paleæ or glumes, the chaff (barley, bluegrass, etc.). The very great similarity of grass seeds makes it possible for unscrupulous dealers to mix worthless or less valuable seed with the seed of valuable species, or even to make complete substitutions.

The tribes of the grass family may be divided into two series with the following arrangement, which is mainly in accordance with the classification of Hackel:

SERIES A. Spikelets 1- or 2-flowered; when 2-flowered the lower imperfect (staminate), the upper fertile; at maturity falling from the pedicel entire or together with certain joints of the axis.

1. *Maydeæ*: Indian corn (Zea mays); Teosinte (Euchlaena luxuriana); Job's Tears (Coix lachryma).

2. *Andropogineæ*: Sugar-cane (Saccharum officinarum); Sorghum (Sorghum vulgare and var.); Johnson Grass

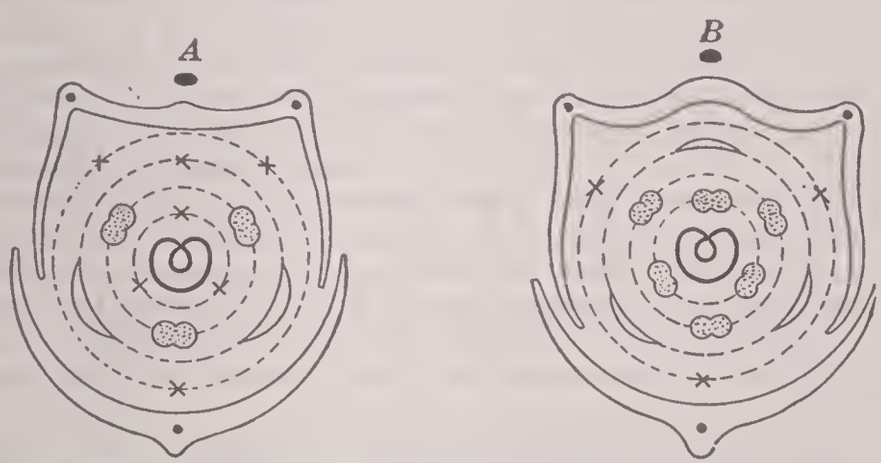


Fig. 5.

A, Diagram of a typical grass flower; *B*, floral diagram of a bamboo. Organs which are wanting are indicated by a cross.

(Sorghum halepense); Lemon Grass (Andropogon schænanthus and citratus), native in India and cultivated in western greenhouses; the bluestems of the plains of North America (Andropogon var.).

3. *Zoysieæ*: Hilaria species; Tragus, a weedy grass in in S. E. United States. Most of tribe unimportant.

4. *Tristegineæ*: All tropical.

5. *Panicæ*: Barnyard Grass or Billion Dollar Grass (Echinochloa crus-galli); Panicum species, 300, some valuable for forage or grain, others of a weedy nature, as Sprouting Crab-grass, etc.; Pennisetum (40 species, mostly African). Feather-grass is cultivated for ornament, while some furnish grain or hay; Paspalum (160 species, mostly tropical); the cultivated millets and the wild weedy grasses called fox-tails (Chætochloa species); Sandbur (Cenchrus tribuloides) is a pernicious weed.

6. *Oryzeæ*: Rice (Oryza sativa); Wild Rice (Zizania aquatica).

SERIES B. Spikelets one to many-flowered; spikelets in falling away leave the empty glumes.

7. *Phalarideæ*: Ribbon-Grass (Phalaris arundinacea, var. picta); Canary Grass (Phalaris Canariensis); Sweet Vernal-grass (Anthoxanthum odoratum); Holy Grass or vanilla-grass (Savastana odorata).

8. *Agrostideæ*: Timothy (Phleum pratense), Meadow Foxtail (Alopecurus pratensis) and Red Top (Agrostis alba) are among the most important cultivated forage grasses; many wild species of Muhlenbergia, Calamagrostis, etc., are also of value; Aristida and Stipa species produce pointed barbed fruits which easily penetrate the skin of grazing animals, especially sheep.

9. *Aveneæ*: Oats (Avena sativa); Tall Oat-grass (Arrhenatherum elatius).

10. *Chlorideæ*: Cord-grass (Spartina cynosuroides); Grama Grass (Bouteloua), Racemed Bouteloua (Atheropogon curtipendulus), and Buffalo-grass (Bulbilis dactyloides) are characteristic of the plains formations; Wire-grass (Eleusine Indica), a weed of fields and dooryards.

11. *Festuceæ*: Fescue-grasses (Festuca species), of which Meadow fescue (Festuca pratensis), sometimes called English Blue-grass, is an important representative; Orchard Grass (Dactylis glomerata); Kentucky Blue-grass (Poa pratensis) and other species of Poa are important pasture grasses; Hungarian brome-grass (Bromus inermis), an importation especially adapted to the semi-arid regions; the ornamental pampas grass of South America (Gynerium argenteum); several species are troublesome weeds: cheat or chess (Bromus secalinus); and Stink-grass (Eragrostis major).

12. *Hordeæ*: Wheat (Triticum sativum); Rye (Secale cereale); Barley (Hordeum sativum); Wild Barley (Hordeum jubatum); Spelt (Triticum spelta); Emmer (Triticum dicoccum); Einkorn (Triticum monococcum); Ray grasses (Lolium species) of which English Rye (L. perenne) and Darnel (L. temulentum) deserve special mention; Wheat grasses (Agropyron species), including quack-grass (A. repens), which is a troublesome weed and also an official drug; Wild Rye-grasses (Elymus species), etc.

13. *Bambuseæ*: Bamboos (Bambusa species), large grasses, some of which reach the magnitude of trees.

The grasses constitute the most important single family of the vegetable kingdom from the utilitarian standpoint. The great bulk of the world's food supply comes from species of grasses, of which the cereals are especially rich in carbohydrate and proteid foods, while fats or hydrocarbons may be derived in considerable quantity from some species. The cereals, on account of their high starch and proteid content, are extensively used for flour and breakfast foods, and with other grains and forage grasses constitute the principal food of our herbivorous domestic animals. For peculiarities of composition of the cereals, see BREAD, or under their respective titles. Commercial starch, used for food or for other economical purposes.

is derived in large part from cereals, especially corn, wheat and rice. Cereals or other grasses or their products are among the most important sources of fermented or spirituous liquors. When by the process of *malting* (see BEER) a considerable part of the starch is changed into sugar, a fermented liquor is made from it, of which beer or ale made from barley is the most familiar example. When barley malt or a mixture of barley malt and rye or corn is properly mashed, fermented and distilled, different kinds of whiskey are produced, or when molasses, the product of sugar-cane, is properly fermented and distilled an alcoholic compound called rum is produced. Rice and millet are used as the sources of alcoholic beverages, particularly in the Orient. Grasses are important as sources of commercial or denatured alcohol, the cereals being the most important, while sugar-producing plants like sugar-cane and sorghum may be used to some extent. (See INDUSTRIAL ALCOHOL.) While sugar is present in nearly all grasses to some extent, it is only present in sufficient quantities to be of commercial importance in a comparatively small number of species. Sugar-cane is the most important as a source of commercial sugar and different kinds of syrups and molasses, while sorghum and maize stalks have a much more limited use, especially the latter.

The agricultural importance of grasses as pasture and fodder (hay, straw and silage) for domestic animals can not be overestimated (see FODDER), while their indirect value in contributing to the humus content of soils should not be overlooked. A few species are cultivated for ornamental purposes, as Job's tears (Coix lachryma), Ribbon grass (Phalaris arundinaceæ), etc., while some have a very agreeable fragrance when dried, as in the case of the sweet-scented vernal-grass (Anthoxanthum odoratum) and holy grass (Savastana odorata). Grasses exert an important influence as protective coverings, affecting soils by modifying water loss and run-off and modifying the radiation of heat. Their conservative effect in preventing or retarding erosion is well marked, while some species are of importance as cover-crops in orchards. Some species are particularly valuable as soil binders on railway grades, sand-dunes, or sand-hills. Species which produce a dense tangle of roots or a network of underground stems, as Psamma arenaria, Elymus arenarias, Agropyron juneaceum, etc., are especially valuable in this work. Some vagabond or ruderal grasses become noxious weeds.

Some grasses are poisonous under certain conditions, for example, sorghum varieties and Johnson grass, which owe their poisonous properties to the production of prussic acid, which is sometimes present when these species are stunted or retarded in their development. Under such conditions a sufficient amount of prussic acid is produced to be instantly fatal to herbivorous animals. The fruit of darnel (Lolium temulentum) which harbors

the hyphæ of a fungus, is poisonous, as is also L. remotum. Ergot-infested grasses, like rye and the wild-rye and wheat grasses are the cause of the disease in man and animals known as ergotism.

Several species of grasses with barbed awns are the source of inconvenience and injury to domestic animals. The fruits of Stipa and Aristida species often bury themselves in the skin and muscles of sheep, dogs and other animals, where they sometimes produce sufficient irritation to cause death. The barbed awns of barley, wild barley and similar grasses when present in cured fodder may work themselves into the mucous membrane of animals and cause deep, ulcerating sores. The barbed awns and trichomes of grasses may also produce or help to produce hair-balls in the stomachs of ruminants.

A large number of grasses both wild and cultivated are affected by fungus diseases, of which the following may be mentioned: smuts, rusts, ergot, cat-tail fungus, powdery mildew, scab, blast, black-spot, leaf disease or 'take all,' yellow leaf-disease of barley, leaf browning of corn, etc. Several bacterial diseases may be mentioned, as: bacteriosis of corn, wilt of sweet-corn, sorghum blight, blight of wheat, and gummosis of sugar-cane. Many of these diseases cause extensive loss each year, especially in connection with our cereal crops which are extensively cultivated. Much of the loss can be prevented by proper culture, preventive methods and the selection of disease-resistant varieties.

The woody stems of the larger grasses are applied to a great variety of economical purposes (see BAMBOO). Besides bamboos other grasses are used for buildings and furniture to some extent. Some of the smaller grasses are used extensively for thatch in some countries, and it is grasses that make possible the sod house of the plains. Grass chairs and other articles of household furniture have been quite extensively manufactured in recent years at several places in the United States. Different species of grasses are made by platting into straw hats, ladies' bonnets, etc., or woven into matting. (See STRAW-MANUFACTURES.) Some grasses are twisted into ropes, and have a limited use for this purpose in some countries, as the *moonja* (Saccharum ciliare) of India. The fiber of some, as the *esparto* (Stipa tenacissima) growing in Spain, Barbary, etc., has been much used not only for ropes but also for mats, sacks, and other very coarse fabrics, but is now used for making paper more than anything else. Various other grasses, as wheat, rye, barley, oats, sorghum, bamboo, etc., may furnish the fiber for paper (see PAPER), while various wild grasses might also be used.

Several grasses or grass products are used as drugs: Triticum (Agropyron repens), the rhizome of which is diuretic and demulcent; Zea (Zea mays), the style and stigmas (silks) constitute the official drug, and are mildly stimulant and diuretic. In addition to the above, Sac-

charum (cane-sugar), Oleum maydis (maize oil), Amylum (starch), Maltum (malt) and Vetiveria (Andropogon muricatus) may be mentioned. Grass-oil, a volatile oil, is distilled from A. muricatus and various other species in the East Indies (see GRASS-OIL). This is used mainly as a perfume or for adulterating perfumes.

GRASS FINCH, VESPER SPARROW, or BAYWINGED BUNTING: a well-known and abundant bird (*Poöcætes gramineus*), of the family *Fringillidæ*, found throughout the eastern United States and Canada, and represented in other parts of temperate North America by distinct sub-species. It is about six inches long and may be recognized by its streaked plumage, the bay or chestnut wing-patch and the white outer tail-feathers which are conspicuously shown during flight.

GRASSHOPPER-FROG, or CRICKET-FROG: a small agile, noisy frog (*Acris gryllus*), whose spring cry is like the rattling produced by striking rapidly together two resonant pebbles. It is about an inch long, brown with a blackish triangular patch on the back of the head and a dorsal stripe. Its eggs are attached in little masses to a blade of marsh-grass.

GRASS'HOPPERS: insects, of comparatively large size, forming a family of the ord. *Orthoptera*, section *Saltatoria*, called *Gryllidæ* by some (chiefly English) entomologists, and *Locustidæ* by others—those who adopt the former name designating the crickets (q.v.) *Achetidæ*. Locusts (q.v.), however, do not belong to this family, though very closely allied, but are distinguished from it by greater robustness of frame, shorter legs, and shorter antennæ. The antennæ of the grass-

Grasshopper, Female (*Gryllus viridissimus*).

hoppers are long and threadlike, as in the crickets. The wings of grasshoppers, as of locusts, fold together like the sides of a roof, while those of crickets are horizontal when at rest. Grasshoppers, like crickets and locusts, have the thighs of the hinder legs very large and adapted for leaping. But grasshoppers do not leap with so great energy as locusts, nor are they capable of so sustained a flight. They are, indeed, some of the family in which the wings are merely

rudimental, and the elytræ or wing-covers of small size. Most of them, however, have well-developed wings; and the wing-covers of the males, as in crickets, have a spot at the base of a talc-like appearance, by the rubbing together of which that chirping sound is produced which is probably connected with the sexual instincts of the insects, but which we have learned to associate with bright green pastures and sunshiny days. Grasshoppers are herbivorous. They are numerous in most parts of the world. A large species is the GREAT GREEN GRASSHOPPERS (*Gryllus viridissimus*, known al as *Locusta viridissima* and *Acrida viridissima*), about two inches in length, and of a fine green color. A green color prevails among the grasshoppers of temperate climates, enabling them more readily to elude observation among the herbage in midst of which they live; but some tropical species are richly colored, and some have very large wings, almost like those of lepidopterous insects. The greater number of grasshoppers feed on grass and the leaves of herbaceous plants. Experiments have been made to utilize the American grasshopper as an article of food.

GRASS'MOTH (*Crambus*): genus of small moths, allied to the clothes-moths, of which the species are numerous, inhabiting pastures, where they are often seen to rise in great numbers when disturbed; and soon to settle again on the blades of grass. Their form, when their wings are closed, is long and narrow, pointed at the head, abruptly cut off at the opposite end. They are often brown and white, sometimes silvery and golden.

GRASS OF PARNAS'SUS (*Parnassia*): genus of plants, generally regarded as belonging to the nat. ord. *Droseraceæ*, but referred by Lindley to *Hypericaceæ*. The calyx is deeply 5-cleft, there are 5 petals, 5 stamens; and 5 scales fringed with globular-headed threads alternate with the stamens, which are regarded by Lindley as bundles of altered stamens; there are four stigmas, and the fruit is a 1-celled, 4-valved capsule with many seeds. The genus consists of a few small herbaceous plants, with flowers of considerable beauty, growing in wet situations in the colder northern parts of the world. Some are found within the Arctic circle, and to the snow line of the Alps, Himalaya, and other mountains. The common grass of parnassus (*P. palustris*) is an ornament of bogs and wet places in various parts of Europe, with heart-shaped leaves, mostly radical and on long foot-stalks, and one sessile leaf on the stem, which is about eight or ten inches high, and bears in autumn a solitary yellowish-white flower. It is called *Agrostis en to Parnasso* by Dioscorides, whence its modern name.

GRASS OIL: fragrant volatile oil obtained from the leaves and stems of certain grasses of the genus *Andropogon* (see LEMON GRASS), natives of India. The kind known as *grass-oil of Nemaur* is produced at the foot of the Vindhya Hills, and is exported from Bombay.

It has been ascribed to the grass called vittievayr or cuscus (*A. muricatus*); to another species, which Dr. Royle supposes to be the *Calamus aromaticus* of the ancients; and to a third, like these, a very fragrant grass (*A. Iwarancusa*). Probably it may be obtained from more than one species. It is obtained by distillation; the grass, being cut when it begins to flower, is bound in small bundles, which are thrown into a boiler with water, and the oil, as it distills over, is received in cold water, from which it is afterward skimmed. It is of light straw color, has a peculiar rich agreeable odor, and is very pungent and stimulating. It is used in medicine, as a stimulant and diaphoretic but more frequently as a liniment in chronic rheumatism. Its chief use, however, is in perfumery. It is sometimes called *ginger-grass oil*, but commonly *oil of geranium* by perfumers, and by druggists *oil of spikenard*.—Similar to this, though differing, and obtained from other species of the same genus, is the oil known as oil of lemon grass. See CITRONELLA.

GRASS'TREE (*Xanthorrhœa*): genus of plants of nat. ord. *Liliaceæ*, natives of Australia, constituting a peculiar feature in the vegetation of that part of the world. They have shrubby stems, with tufts of long wiry foliage at the summit, somewhat resembling small palms; a long cylindrical spike of densely aggregated flowers shooting up from the centre of the tuft of leaves. The base of the inner leaves of some species is eatable, and forms, particularly when roasted, an agreeable food. It has a balsamic taste; and all the species abound in a resinous juice, which, on exposure to the air, hardens into a reddish-yellow inodorous substance, with a shining fracture, soluble in alcohol, and useful as a tonic in dysentery, diarrhea, and other intestinal maladies; used also by the natives of Australia for uniting the edges of wounds, and with an aluminous earth for caulking their canoes, and as a cement for various purposes. The common grass tree (*X. hastilis*) has a stem about 4 ft. high, but sometimes a foot in diameter. It is of very slow growth, and is supposed to be many centuries old when it has reached such dimensions.—Several species are found in e. Australia, where their leaves are used as fodder for all kinds of cattle.

GRASSUM, n. *grăs'ŭm*, or GERSOME, n. *gėr'sŭm* [mid. L. *gersūmă*, a fine or extra sum paid for possession: AS. *gersume;* Icel. *görsemi*, a treasure]: in the *law of Scotland*, a lump sum paid by persons who take a lease of landed property; a sum paid by a tenant to his landlord at the entry to a lease over and above the rent payable that year, or by a new heir to a lease or feu to a superior, usually double the feu-duty or rent payable that year; a compensation.

GRASS VALLEY, California, a city in Nevada co., on the Nevada co. Narrow-Gauge r.r., about 69 m. n. by e.

of Sacramento. It was first settled in 1849, and incorporated in 1861. The city is in the midst of one of the richest gold quartz-mining districts of the state, and has extensive quartz mills, marble and granite works, distillery, wine manufactory, etc. There is a public high school library, Mount St. Mary's Academy, and Grass Valley and St. Patrick's Orphan Asylums. Pop. 4,800.

GRASS'WRACK (*Zostéra*): genus of plants of nat. ord. *Naiades*, one of the few genera of phanerogamous plants which grow among seaweeds at the bottom of the sea. The leaves are narrow and grass-like; and the flowers consist merely of stamens and pistils, without any perianth, inserted on the central nerve of one side of a flat thin linear *spadix*, with a leafy *spathe*. The pollen is confervoid. The common grasswack (*Z. marina*) is a perennial plant, which forms green meadows on the sandy bottom of shallow parts of many seas, and abounds in creeks and salt-water ditches. It becomes white by exposure to the air. The rush-like coverings of Italian liquor-flasks are made of it, and it is much used for packing glass bottles and other brittle ware. It has been long used in Holland, Gothland, and Iceland for stuffing pillows and mattresses, and this use has of late years much extended, so that the plant has become an article of commerce, under the name of *Alga marina*, or more usually, but incorrectly, *Alva marina* (Ger. *Seegras*).

GRAT, v. *grăt* [pt. of Scotch *greet*, to cry, to shed tears]: cried; shed tears.

GRATE, n. *grāt* [L. *crātēs;* It. *grata*, a grate, a hurdle: Pol. *krata*, a grate, a lattice]: a framework of iron bars for holding the fuel in a fireplace; a partition or frame made of bars. GRA'TING, n. the iron framework over a window, a cellar entrance, and the like.

GRATE, v. *grāt* [OF. *grater;* F. *gratter*, to scratch, to scrape: It. *grattare*, to scratch, to rub—from mid. L. *cratārĕ:* Ger. *kratzen*, to scratch: Icel. *grata*]: to rub one body against another so as to produce a harsh sound; to wear away into small particles by rubbing against anything rough; to act or utter so as to offend; to irritate; GRA'TING, imp.: ADJ. rubbing; causing a sense of harsh rubbing or rasping; offensive; disagreeable: N. a harsh sound or rubbing. GRA'TED, pp. rubbed harshly; worn off by rubbing. GRATER, *n. grā'tĕr*, a kind of kitchen rasp; any rough instrument to grate with. GRA'TINGLY, ad. *-lĭ*, harshly.

GRATE: iron cage holding the coal for a fire. Considerable improvements have been made of late years in the construction of common domestic grates. Our forefathers simply added an iron cage to the old form of fireplace built originally for burning a pile of wood. This was a large square-sided recess, with a very wide opening for the chimney. Count Rumford pointed out the

disadvantages of this, and the principles upon which they should be remedied (see CHIMNEY). In the modern grate, the filling up of the square cavity recommended by Count Rumford, and also his plan of lowering and narrowing the throat of the chimney, are often effected by iron plates forming part of the grate. These plates are readily heated, and with equal readiness radiate and reflect the heat into the room, and thereby effect a considerable saving of coal, besides which the grate itself is brought forward level with, or even projecting beyond the walls of the room, whereby the radiation from the heated coal is utilized to the utmost. One of the most effective as well as elegant forms of grate is that which consists simply of a large square iron plate set nearly flush with the wall, in the middle of which is a hemispherical cavity with bowed bars in front, and a trapped opening into the chimney in the upper part of this cavity. When there is sufficient draught, this form of grate gives a good fire, and effects the maximum economy of fuel for an open fireplace (always somewhat wasteful though more healthful, compared with a stove). The curved surface behind and above the fire radiates and reflects into the room from every part of its surface, and the plate flush with the wall, which is heated by conduction, may be regarded as a part of the room, and thus the main condition economy is effected, viz., throwing as much as possible of the heat into the room, and allowing as little as possible to go up the chimney. A lining of firebrick or of fireclay, molded to the form of the back of the grate, is useful in retaining the heat necessary for complete combustion of coal; the firebrick being a bad conductor and an excellent radiator, becomes red-hot on its surface next to the coal, and this heat is not carried away, but is radiated into the fire, and assists in burning the carbon of the smoke. See CHIMNEY.

GRATEFUL, a. *grāt'fûl* [L. *gratus*, pleasing, agreeable: It. *grato*]: having a due sense of benefits or kindness; agreeable; affording pleasure to the senses. GRATE'FULLY, ad. *-lĭ*. GRATE'FULNESS, n. GRATIFY, v. *grăt'ĭ-fī* [OF. *gratifier*, to gratify—from L. *gratĭf'ĭcārĕ*]: to give pleasure to; to delight; to please. GRAT'IFYING, imp.: ADJ. giving pleasure. GRAT'IFIED, pp. *-fīd*.. GRAT'IFICA'TION, n. *-fĭ-kā'shŭn* [F.—L.]: the act of pleasing the mind, taste, or appetite; that which affords pleasure or delight. GRAT'ITUDE, n. *-tūd* [F.—from L. *gratĭtūdĭnem*]: a desire to return benefits received; a sentiment of good-will toward a benefactor; gratefulness.—SYN. of 'grateful': pleasing; gratifying; welcome; delightful; delicious; thankful; acceptable:—of 'gratify': to humor; indulge; satisfy; satiate; glut; requite; recompense; soothe.

GRATE SHAKING-RIG: a bar attached to the movable grate-bars of shaking or rocking grates, by which they are moved back and forth with a rocking motion,

thus disturbing the fire over the whole area of the grate, to effect proper combustion. It is operated by means of a suitable lever placed in the cab.

GRATIAN, *grā'shĭ-an* (FRANCISCUS GRATIANUS): b. about the end of the 11th c.; native of Chiusi, in Tuscany: compiler of the well-known body of canon law commonly cited under the title *Decretum Gratiani*. It is remarkable, however, that though few authorities have been so frequently cited, or have obtained so wide and permanent acceptance as this celebrated collection, hardly anything is known of the collector's personal history, except that he became, in later life, a Benedictine monk of the monastery of St. Felix in Bologna. The date commonly assigned to Gratian's collection is 1141-50; its title, however, *Decretum*, or *Concordia Discordantium Canon*, is believed to be of later origin. How far the collection is the work of Gratian himself, or how far he was indebted for his materials, and even for their arrangement, to earlier collectors, is not known. The work comprises not only the decrees of councils and popes down to Innocent II. (including the Spurious ISIDORIAN DECRETALS (q.v.), but also passages from the Scripture, from the Fathers, and even from the Roman law. It is divided into three parts. The first regards the hierarchical constitution of the church, and relates chiefly to doctrinal and moral subjects. It is divided into 'distinctions.' The second treats of external jurisdiction, under the head of 'causes' and 'questions.' The third regards the inner life of the church—the liturgy and the sacraments. From his adoption of the Isidorian decretals, it may be inferred that Gratian's authority as a critic is of little value; and, in general, no authority is given to any document beyond what it intrinsically possesses, from the fact of its being placed in Gratian's collection. For the other collectors of the canon law, see CANON LAW.

GRATIANUS, *grā-shĭ-ā'nŭs*, AUGUSTUS, Roman Emperor: 359, Apr. 19—383, Aug. 25 (reigned 375-383); b. at Sirmium, Pannonia; eldest son of Valentinian I. (see VALENTINIANUS I.) by his wife Severa. While he was still *nobilissimus puer* (heir-apparent), he was created consul, and in 367, was elevated by his father to the rank of Augustus at Ambiani (Amiens) in Gaul. In the following year, he accompanied his father in his expedition against the Alemanni. On the death of Valentinian, the troops elevated Gratianus to the throne, giving him at the same time as a colleague his half-brother, Valentinian II. Gaul, Spain, and Britain fell to Gratianus' share; and as his brother was only four years' old, Gratianus is supposed by many authorities to have been the monarch *de facto* of the rest of the Western Empire, fixing his residence at Treviri (now *Treves*). During the first part of his reign, a fierce warfare was carried on against the tribes who possessed the Danubian

provinces and Illyricum; and he was on the point of marching into Thrace, to assist his uncle Valens against the Goths, when he was suddenly called to defend his dominions against the Lentienses, a tribe of the Alemanni. After the invaders had been defeated, Gratianus advanced toward the Eastern Empire, but while on the way, he learned that his uncle Valens had been defeated and killed by the Goths near Adrianople (378, Aug.). The sovereignty of the Eastern Empire then devolved on Gratianus, but feeling his inadequacy to the task of ruling the whole empire, he recalled Theodosius (q.v.) from Spain, and appointed him his colleague 379, Jan. 19. Gratianus possessed some admirable virtues; he was pious, chaste, and temperate; his understanding was well cultivated, though not strong, and his eloquence attractive. But his character was too yielding and pliant, and he was consequently often led to the commission of gross acts of cruelty and tyranny, utterly foreign to his nature. His persecution of the pagans, and afterward of heretic Christians, made him a great favorite with orthodox ecclesiastics, but alienated the affections of his subjects generally, while his fondness for frivolous amusements, and unworthy associates, excited the contempt of the army, so that when Maximus was proclaimed emperor by the legions in Britain, crowds of the disaffected flocked to his standard. Gratianus was defeated by him near Paris, and fled to Lyon, where he was overtaken and killed by Andragathius, whom Maximus had sent in pursuit of him.

GRATICULATION, n. *grăt-ĭk'ū-lā'shŭn* [F. *graticuler*, to divide into small squares in painting—from It. *graticolare:* L. *craticŭlá*, a small hurdle—from *crātēs*, wicker-work, a hurdle]: the art of dividing a plan or design into squares in order the more easily to reduce the copy to a smaller size or to enlarge it.

GRATIFICATION, GRATITUDE, GRATIFY, etc. See under GRATEFUL.

GRATIOLA, *gra-tī'ō-la:* genus of plants of nat. ord. *Scrophularineæ*, having a 5-partite calyx, the upper lip of the corolla bifid, the lower trifid, only two stamens fertile and the anthers pendulous. *Gratiola officinalis*, sometimes called HEDGE HYSSOP, is found in meadows and on margins of ponds and river banks in most parts of Europe. It has sessile lanceolate serrulated leaves and axillary solitary flowers. It is extremely bitter, acts violently as a purgative, diuretic, and emetic; and in overdoses is an acrid poison. It is administered in cases of worms, jaundice, dropsy, scrofula, mania, and venereal diseases; but requires to be used with caution. It is said to render some of the Swiss meadows useless as pastures. It was formerly so highly esteemed as a medicine, that the name of *Gratia Dei* (Grace of God) was given to it, and for the same reason it is known in France as *Herbe au Pauvre Homme* (Poor Man's Herb). It

is said to be the basis of the famous gout medicine called *Eau medicinale. Gratiola Peruviana,* a S. American species, has somewhat similar properties. These properties are supposed to depend upon a bitter resinous principle called *Gratioline.*

GRATIS, ad. *grā'tĭs* [L. *grātis,* freely, for ablative plu. *grātĭis,* out of favor or kindness, without reward—from *grātĭă,* favor]; for nothing; freely; without reward.

GRATTAN, *grăt'an,* The Right Honorable HENRY: 1746, July 3—1820, June 4; b. Dublin. His father was recorder and M.P. for that city until his death 1766. The year after that event, Grattan, having completed his university studies with distinction at Trinity College, Dublin, entered as a student of law at the Middle Temple, London, where, however, he neglected the pages of Blackstone, to listen to the living oratory of parliament, and in particular of Lord Chatham. He was called to the Irish bar 1772, and sat in the Irish parliament for the borough of Charlemont 1775-90, and then he was elected as one of the representatives of the city of Dublin. Mainly to him was owing, among other things, the partial abolition of the heavy restrictions on Irish commerce. But his popularity ebbed as it had flowed (and oftener than once) in the hearts and huzzas of his impulsive and therefore inconstant countrymen. In 1797, he declined to come forward for Dublin, and went into temporary but undeserved eclipse. In 1800, he was returned for the borough of Wicklow, to oppose the Union, and that was to fight for the people's idea of the constitution. But the union was effected in spite of him, and in 1805 he was returned to the imperial parliament for the borough of Malton, in Yorkshire. Next year, he was induced to stand for Dublin, and was re-elected. He sat for it in successive parliaments till his death in London, whither he had gone, contrary to the advice of his physicians, to advocate, as he had been wont, the cause of Rom. Cath. emancipation.

Grattan's public and private character was unimpeachable. For the vacillations of his popularity in Ireland, his countrymen had reason to be ashamed, and it is certain that he now holds a proper and exalted place in the esteem of the people, for whom he labored with such sincerity, integrity, and genius. The history of his life is in great measure the history of the Irish constitution, and entirely the history of the parliament of Ireland. —As an orator, in spite of faulty elocution and peculiarly ungraceful gesture, he stands in the first rank. His style is full of point, rapidity, antithesis, and poetic suggestiveness. His eulogy on Chatham, and his invective against Bonaparte, are not surpassed in British eloquence. His speeches, also *Life and Times,* were published by his son and biographer. A statue of Grattan, on College Green, Dublin, was unveiled 1876.

GRATUITOUS, a. *gră-tū'ĭ-tŭs* [L. *gratu'ĭtŭs,* that is

done without reward or profit—from *grātĭă*, favor]: free; not required by justice; without cause or provocation; assumed or taken without ground or proof. GRATU'ITOUSLY, ad. *-lĭ*. GRATU'ITY, n. *-ĭ-tĭ*, a gift; a present; a donation.

GRATU'ITOUS DEED, in the Law of Scotland: deed granted without any value received; in the law of other countries usually styled a gift (q.v.), or a voluntary conveyance (q.v.).

GRATULATE, v. *grăt'ū-lāt* [L. *gratŭlātŭs*, wished joy to—from *gratŭlor*, I wish joy to, I congratulate]: to salute with declarations of joy; to congratulate. GRAT'ULA'TION, n. *lā'shŭn*, an address or expression of joy to a person. GRAT'ULA'TORY, a. *-tėr-ĭ*, expressing congratulation.

GRATZ (officially GRAZ; formerly *Grätz*): capital of the Austrian crown-land of Styria; picturesque old town, on both sides of the Mur, encircled by gardens and pleasure-grounds. It is 140 m. s.s.w. of Vienna by railway. The inner town, connected with the suburb on the w. side of the river by two chain and two wooden bridges, is surrounded by walls and by a promenade (formerly the glacis) shaded with trees, has narrow and crooked streets, and is not remarkable for cleanliness. It is noticeable for old buildings, e.g., the cathedral of St. Agidi, built in the 14th c.; the ancient castle of the Styrian dukes with many curious relics of antiquity; the Landhaus, where the nobles of the duchy held their meetings; the university, founded 1585, with its library of 70,000 vols., museum, etc.; the arsenal, and various palaces of the Styrian nobility. Gratz is well provided with gymnasia and other public educational establishments for the laity, and seminaries for the clergy. As the seat of govt. for the circle, Gratz has special courts of law and administration, and is of considerable importance. It has manufactures of steel and iron wares, cotton, linen, and woolen fabrics, leather, paper, saltpetre, etc. From its position on the direct line of railway communication between Vienna and Trieste, it is an intermediary station for the trade of the Austrian capital and the Adriatic provinces. Gratz is the residence of a prince-bishop, and has, besides a Prot. church and a synagogue, 23 Rom. Cath. churches, some very ancient. The country around is singularly beautiful and picturesque. Pop. (1900) 138,080.

GRAU'BUNDEN, or GRAU'BUNDTEN. See GRISONS.

GRAU, MAURICE, American operatic manager: b. Brunn, Austria, 1849, d. Paris, France, 1907, March 14. He came to the United States with his parents in 1854; was graduated from the New York College in 1867, and from Columbia Law School. From 1872 until 1903 he was the most prominent operatic manager in America, securing a long line of singers, musicians, and actors,

including names so diverse as Aimée, Rubenstein, Salvini, Sarah Bernhardt, Patti, Irving, Coquelin, Jane Hading, Mounet-Sully, Mme. Rejane. As director of the Maurice Grau Opera Company, he brought some of the most famous singers of the day to America.

GRAVAMEN, n. *grā-vā'mĕn* [L.—from *grăvĭs*, heavy, weighty]: cause of complaint or action.

GRAVE, a. *grāv* [F. *grave*—from L. *grăvĭs*, heavy, weighty: It. *grave*]: serious; sedate; not gay, light, or trifling; weighty; momentous; in *music*, not acute or sharp; deep in sound. GRAVE'LY, ad. *-lĭ*. GRAVITY, n. *grăv'ĭ-tĭ* [F. *gravité*—from L. *gravitātem*]: weight, heaviness; seriousness; solemnity: see GRAVITATE. SYN. of 'grave': solemn; staid; sober; sage; demure; thoughtful; important; influential; plain; low; deep.

GRAVE, n. *grāv* [Ger. *grab;* Dut. *graf;* Icel. *grafa;* Pol. *grob*, a grave: Dut. *grave*, a ditch, anything dug; *graven*, to dig]: *literally*, that which is dug out; the pit in which a dead body is laid; a tomb; a sepulchre; any unhealthful place where many deaths have taken, or do take, place; death: V. in *OE.*, to place in a grave; to dig. GRAVE-CLOTHES, the dress in which the dead are interred. GRAVEDIGGER, n. one who digs and prepares graves. GRAVE'LESS, a. without a grave. GRAVE-ROBBING, offense by statute in most of the states, consisting in unlawful removal from grave or vault, of a dead body, or in opening a vault or grave with intent to steal anything therein. A cognate offense is the receiving of a stolen body.—See ANATOMY, in Law. GRAVE-STONE, a monumental stone. GRAVE-WAX, a familiar term for adipocere, because occasionally found in graves. WITH ONE FOOT IN THE GRAVE, with the sure prospect of a speedy death.

GRAVE, v. *grāv* [F. *graver;* to carve: Ger. *graben;* Dut. *graven*, to carve, to dig: connected with GRAVE 2]: to carve or cut letters or figures on any hard substance, as stone or wood; to carve or form. GRAV'ING, imp.: N. in *OE.*, carved work. GRAVED, pp. *grāvd*, or GRAVEN, pp. *grā'vn*, carved or cut. GRA'VER, n. an engraving tool.

GRAVE A SHIP, GRAVING-DOCK. See under GRAVES.

GRAVEL, n. *grăv'ĕl* [It. *gravella;* F. *gravelle*, sand: OF. *grave*, rough sand]: small stones or pebbles, rounded by the action of water; sandy matter sometimes found in the kidneys or the bladder: see CALCULUS: V. to cover with gravel; to puzzle; to embarrass; among *horses*, to hurt the foot by gravel in the shoe. GRAV'ELLING, imp. covering with gravel; hurting the foot as of a horse: N. act of covering with gravel. GRAV'ELLED, pp. *-ĕld*, covered with gravel. GRAV'ELLY, a. *-lĭ*, abounding with gravel. GRAVEL WALLS, walls of houses, built up of a conglomeration of cement, or lime, with small pebbles or slag, which materials are kept in place by casings

of planks till the walls have hardened—openings having been left for doors and windows.

GRAVEL: small stones ranging from the size of a pea to that of a walnut, usually intermingled with sand, clay, or other substances. Soils in which gravel predominates are not as desirable for cultivation as many others. They often contain large quantities of the mineral elements required by plants, but largely in unavailable condition. Manures applied to gravel act quickly, but are liable to lose a large portion of their valuable constituents by leaching through the soil beyond the reach of plant roots, and by evaporation, which proceeds more rapidly than in compact ground. Gravelly soils are also subject to drought, and crops are often ruined by this cause, while on adjoining loams they suffer but little. These soils are harder to cultivate than loams, and wear plows and other implements much more rapidly. There are many grades of gravelly soils, varying greatly in value for agricultural purposes. In their present state some are almost worthless, being suitable only for pastures, though capable of improvement by the use of fertilizers and the plowing under of green crops (see MANURES). Others, which approach more nearly to loam, are reasonably fertile, and if managed according to their special needs, may be profitably cultivated.

GRAVEL. Used in brewing to denote the appearance of the beer when yeast-cells are floating about in it in the form of fine "gravel."

GRAVEMENTE, ad. *grâ-vā-mĕn'tā* [It.]: in *music*, slowly and in solemn style.

GRAVEOLENT, a. *grā-vē'ō-lĕnt* [L. *grăvĭs*, heavy; *ŏlĕō*, I smell]: strong-scented. GRAVE'OLENCE, n. *-lĕns*, a strong and offensive smell.

GRAVES, or GREAVES, n. plu. *grāvz* [Sw. *grefwar*, Low Ger. *grebe;* Ger. *gruben*, graves: It. *gruma*, the sediment that sticks to anything, tartar: Sw. *grums*, grounds, dregs]: the dregs at the bottom of the pot in melting tallow made up into cakes as food for dogs, etc. TO GRAVE A SHIP, to smear the hull with graves, for which pitch is now employed. GRAVING, n. *grā'vĭng*, the act of cleaning a ship's bottom and covering it with pitch. GRAVING-DOCK, a dock from which the water can be withdrawn in order to smear a ship with graves; an inclosure on the side of a river or on the seashore, into which a vessel can be floated for examination and repairs. See DOCK.

GRAVES, ANSON ROGERS, American Protestant Episcopal bishop: b. Wells, Rutland County, Vt., 1842, Apr. 13. After being graduated at Hobart College, he took a course at the General Theological Seminary 1870. When the missionary district of Platte (now designated the missionary district of Laramie) was constituted in 1889, he was consecrated first bishop 1890, Jan. 1.

GRAVES, Frederick Rogers, American Protestant Episcopal bishop: b. Auburn, N. Y., 1858. He was graduated at Hobart College (1878), and the General Theological Seminary (1881). His ministry has been devoted to work in China, he having been ordained for the foreign missionary field, deacon in 1881 and priest in 1882. His consecration as bishop of Shanghai took place in 1893. He has published several works in Chinese.

GRAVES, John Temple, American journalist and orator: b. Wellington Church, Abbeville District, S. C., 1856, Nov. 9. He was graduated at the University of Georgia in 1875. He is generally classed with Henry Grady as an orator and leader of patriotic sentiment in the South. He was on the staff of the Atlanta *Journal* for many years, was editor-in-chief of the Atlanta *Daily Georgian* 1905–7, and since 1907 of the New York *American*. He has written *History of Florida; The Negro;* etc.

GRAVESEND, *grāvz'ĕnd:* port and borough in Kent, on the right bank of the Thames; 24 m. e.s.e. of London; in a commanding position on the first rising ground after entering the river; Gravesend consists of the old town, with narrow and not cleanly streets, and of the handsome new town w. of the old portion. In the vicinity are extensive market-gardens, great part of the produce of which is sent to London. Many of the inhabitants are employed in fishing. Gravesend forms the limit of the port of London. Here pilots and custom-house officers are taken on board of vessels going up the river. For centuries, the prosperity of the town has depended on its connection with the metropolis. The salubrious air and beautiful scenery at Gravesend render it a favorite watering-place with Londoners. It carries on some ship-building and a considerable trade in supplying ships' stores. Pop. of mun. bor. (1901) 27,200.

Gravesend was originally a *hythe*, or landing-place, and is mentioned as such in Domesday. Around this landing-place a town grew up soon after the Conquest. Here the fleets of the early voyagers, as that of Sebastian Cabot 1553, and of Martin Frobisher 1576, used to assemble; and here the lord mayor, aldermen, and city companies were wont to receive all strangers of eminence, and to conduct them up the river in state, forming floating processions, which, says the historian Froude, were 'spectacles scarcely rivalled in gorgeousness by the world-famous weddings of the Adriatic.'

GRAVEYARD INSURANCE. A term used to designate a method of swindling insurance companies by the substitution of a person of robust health for the bad risk actually insured. Also used to describe other kinds of insurance swindling, or crimes committed in the collection of insurance moneys.

GRAVID, a. *grăv'ĭd* [L. *grăvĭdŭs*, heavy with young—from L. *grăvis*, heavy]: weighty; being with young; pregnant. Gravid'ity, n. *-ĭ-tĭ*, pregnancy.

GRAVIER, *grâv-e-ā'*, JACQUES: d. 1708; b. France: missionary. He entered the Soc. of Jesus and went to Canada prior to 1684, in which year he was sent to the Ill. region, where he labored among the Kaskaskia and other tribes of Indians. He succeeded Allouez as superior of the Ill. mission 1690, became vicar-gen. 1691, built a chapel near French Fort on St. Joseph's river for the Miamis Indians, and converted and baptized over 200 Kaskaskias in 8 months. He established missions among the Cahokia, Tamarois, Osage, and Missouri tribes, visited Montreal 1696, returned to his Indian labors, was severely wounded by a party of Illinois Indians, and after being unsuccessfully treated in Paris, went to La. 1708, Feb. 12, and died soon afterward in Mobile.

GRAVIGRADA, n. *grăv-ĭ-grā'da* [L. *gravis*, heavy; *gradus*, a step]: in *paleon*, ground-sloths; tribe of edentate mammals, now extinct; allied to the sloths of the present day, but of the size of the rhinoceros or hippopotamus, though their feet were fitted for digging instead of climbing. They seem to have obtained food by digging around the roots of trees and overturning them. GRAV'IGRADE, a. *-grād*, walking heavily; of or pertaining to the edentate tribe or family *Gravigrada*.

GRAVIMETER, n. *gră-vĭm'ĕ-tĕr* [L. *grăvis*, heavy; Gr. *mĕtrŏn*, a measure]: an instrument for ascertaining the specific gravity of bodies, whether liquid or solid. GRAVIMETRIC, a. *grăv'ĭ-mĕt'rĭk*, of or pertaining to; applied to chemical analysis when proceeding by fixed weights, in contradistinction to volumetric.

GRAVINA, *grâ-vē'nâ:* commercial and industrious episcopal town in s. Italy, province of Bari, on a hill above the left bank of a stream named Gravina, 37 m. s.w. of the town of Bari. It occupies the site of ancient *Blera*, one of the stations on the Via Appia, which passed at Poggio Orsino, about a mile from the town. In 995, it sustained a memorable siege against the Saracens. It was a favorite hunting place of Emperor Frederick II. The neighborhood possesses rich pastures, and raises a celebrated breed of horses, in which the inhabitants do a large trade at their annual cattle-fair. Pop. abt. 15,000.

GRAVING, GRAVING-DOCK. See under GRAVES.

GRAVITA, *grâ'vē-tâ:* Italian term used in music, signifying that it is to be performed with an earnest and dignified expression, with a movement in slow, marked and solemn time.

GRAVITATE, v. *grăv'ĭ-tāt* [L. *gravĭtātem*, heaviness —from *grăvis*, heavy: It. *gravita:* F. *gravité*]: to tend toward the center of attraction. GRAV'ITATING, imp. a. tending toward another body by the law of gravitation. GRAV'ITATED, pp. GRAV'ITA'TION, n. *-tā'shŭn* [F.—L.]: the peculiar force by which all bodies are drawn to the

surface of the earth or in the direction of its centre; the tendency of all bodies, at liberty, to approach each other. GRAV'ITY, *n.* *-ĭ-tĭ*, weight; heaviness; gravitation; seriousness; solemnity; weight of guilt. CENTRE OF GRAVITY, the point of a body which being supported all the other parts will be equally balanced. SPECIFIC GRAVITY, the relative weight of any solid or liquid compared with the weight of an equal bulk of distilled water; or of any gas compared with air: see further, SPECIFIC GRAVITY.—SYN. of 'gravity': sobriety; enormity.

GRAVITATION—GRAV'ITY: peculiar force by which all material bodies tend to draw toward each other; its nature is unknown. All bodies, when raised into the air and left unsupported, fall to the earth in lines perpendicular to it. The force which causes them to do so is termed gravity, and—universal experience shows—acts toward the earth's centre; more strictly, it acts perpendicularly to the surface of still water. But if a body, as a stone, be projected obliquely into the air, it is made to describe a curved path, having a highest point, vertex or apogee; and when it meets the earth in its descent, its direction is not the centre, but inclined to it at the angle of projection (see PROJECTILES). Observing this, and that the body, if not interrupted by the earth's surface, would continue to move in a curve, with its tangent always away from the centre, it is easy to imagine that if not interrupted, it might circulate round the centre as the moon does round the earth. Next, knowing that the force of gravity is exerted at all accessible heights above the earth, the question arises—May it not be exerted as far off as the moon? which we know to be influenced by *some* force which continually deflects it from the tangent to its orbit, and makes it circulate round the earth (see CENTRAL FORCES). Observing now the time of revolution of the moon, and calculating its centrifugal force, which we know must equal the centripetal force, we put the question: Is this force the same as gravity? The answer is, that it is a force 3,600 times less energetic. If, then, gravity be the force which really holds the moon to its path, it must be explained why it acts upon that body so much more feebly than it would, were the moon a body on the earth's surface. The explanation is given at once if we suppose gravity to be a force whose energy diminishes with increase of distance, and is inversely as the squares of the distances at which it is exerted; for the distance of the moon from the earth's center is about 60 times that of the earth's surface from its center, and $3{,}600 : 1 :: 60^2 : 1$. We infer that it does so from the fact, that there is nothing inadmissible in such a diminution of energy with increase of distance—that, on the contrary, there are many analogies for it, as in the emanations of light and heat, and in the argument drawn from the necessity of otherwise supposing some other force than

gravity to be employed in deflecting the moon, and the force of gravity to cease at some unknown level. On these views, and a generalization below mentioned, Newton is understood to have at first rested his law of universal gravitation: 'Every particle of matter in the universe attracts every other particle with a force directly proportioned to the mass of the attracting particle, and inversely to the square of the distance between them'—a law, the truth of which, since it was first broached, has been put beyond all question by the most complete body of predictions, fulfilled to the letter, that can be cited in support of any law of nature.

Before, however, the argument on the extension of terrestrial gravity to the sphere of the moon could have become pregnant with so great a result, much investigation had to take place in other fields; and, in fact, Newton had, previously to conceiving the law, explained the three great Keplerian laws of order obtaining in the polar system by reference to an attractive force residing in the sun. These laws of Kepler are—1. That the planets revolve round the sun in ellipses, having the sun for a common focus: 2. That every planet moves in such a way that the line drawn from it to the sun sweeps over equal areas in equal times: 3. That the squares of the times occupied by the several planets in their revolutions in their elliptic orbits, are proportional to the cubes of their mean distances from their common focus, the sun. From the law of equal areas, Newton inferred that every planet is retained in its orbit by a force of attraction directed toward the centre of the sun; from the orbit being elliptical, he inferred that in each case this force varies in intensity according to the inverse square of the bodies' distance from the sun; while from the third law he inferred the homogeneity of the central force throughout the solar system. It was then, after being familiar with the notion of terrestrial gravity, and its action, through the researches of Galileo, Huyghens, and Hooke, and with the notion of a central force acting inversely as the square of the distance of its object, through his explanations of the laws of Kepler, that he put to himself the question: Is not the force with which the moon gravitates to the earth the same with gravity?—the force which causes a stone to fall on its surface. A question answered affirmatively on the supposition of gravity, like the sun's attraction, being a force diminishing with increase of distance, and according to the same law. The result was to bring under the law of gravitation the whole solar system, the planets and the sun, the satellites and their planets—the satellites being observed to obey the same laws of order with reference to their primaries that the latter obeyed in reference to the sun. And the imagination lifted up by the grandeur of the conception, would refuse to limit the operation of that law to our own system, even were there no facts to show its extension beyond. The phenom-

ena of double stars, however, would justify the extension and the statement of the law as above given in universal terms. It is to be observed that the Keplerian laws, which may be said to have been the basis of Newton's researches, are, owing to perturbations caused by the mutual action of the planets, etc., only approximately correct; and that these perturbations afford, when examined, a further proof of the truth and universality of the law of gravitation.

For a notice of speculations as to the nature of the law of gravitation, see FORCE; FALLING BODIES; PROJECTILES; etc.

GRAVY, n. *grā'vĭ* [from *graves*, the dregs of melted tallow: Low Ger. *grebe*, graves]: the juice and fat which drip from flesh while it is roasting; dripping; sauce.

GRAY, or GREY, a. *grā* [Icel. *grar;* AS. *græg;* Low Ger. *graag*, gray: Gr. *graios*, aged, gray: the probable original meaning was party-colored]: white tempered with black; hoary; mature: N. a color compounded of black and white in various proportions; the badger, from its party-colored face; in *heraldry*, the badger. GRAY'ISH, a. *-ĭsh*, gray in a moderate degree. GRAY'NESS, *n.* GRAY-BEARD, an old man; a large coarse earthenware vessel for holding liquors; formerly stoneware drinking-jugs having a bearded face on the spout; the preceding also spelled GREY-. GRAYHOUND, another spelling for GREYHOUND, (q.v.). GRAYSTONE, n. a grayish volcanic rock.

GRAY, *grā:* small town of France, dept. of Haute-Saône, on the slope of a hill overlooking a beautiful meadow, on the left bank of the Saône, 26 m. w.n.w. of Besançon. It is commanded by the remains of an ancient castle, the residence in former times of the Dukes of Burgundy, and has a pleasing appearance from a distance, though its streets are crooked, narrow, and steep. Gray is an important entrepôt for goods from the n.e. districts of France, which are conveyed by the Saône to the south. Its trade is chiefly in corn, flour, timber, wine, iron, and colonial produce. Pop. 7,500.

GRAY, *grā*, ASA, M.D., LL.D.: 1810, Nov. 18—1888, Jan. 30; b. Paris, Oneida county, N. Y.: botanist. He took his degree M.D. 1831, but soon relinquishing the practice of medicine, he applied himself, under Prof. Torrey, to his favorite study of botany. In 1834 he received the appointment of botanist of the U. S. exploring expedition; but as its sailing was long delayed, he resigned his post 1837. He was afterward appointed prof. of botany in the Univ. of Michigan; but before he had entered upon the duties of that office he was elected, 1842, Fisher professor of nat. hist. at Harvard University. In 1873 he retired from teaching to apply himself wholly to science, and 1874 became a regent of the Smithsonian Institute. He ranks among the leading botanists, not only of America, but of the age. In

his numerous writings he has shown equal ability in communicating elementary knowledge and in elucidating recondite theories. He came forward at a time when the old, artificial systems of botany were giving way to the natural system which has taken their place, and he was the first in America, in conjunction with Dr. Torrey, who arranged the heterogeneous assemblage of species upon the natural basis of affinity. In 1836 he published *Elements of Botany*, afterward enlarged into *Botanical Text-book;* and 1838 he commenced, with Dr. Torrey, *Flora of N. America.* In 1848 appeared *Manual of Botany for the Northern United States*, and the first vol. of *Genera Borealia Americana Illustrata.* Among his remaining works are *Botany of the United States' Pacific Exploring Expedition, under Captain Wilkie* (1854–58); *How Plants Grow; Lessons in Botany; Structural and Systematic Botany;* a revised edition of *Botanical Text-book*, 1,300 illustrations; *Flora of the Southern United States; School and Field Book of Botany* (1869); *Botany for Young People* (1869); *Examination of Darwin's Treatise* (1861); *Flora of N. America* (1878); and *Natural Science and Religion* (1880). Prof. Gray contributed many papers to scientific periodicals and the transactions of learned societies.

GRAY, David, American journalist: b. Buffalo, N. Y., 1870, Aug. 8. He was graduated from Harvard in 1892, entered journalism in 1893 as a reporter and editorial writer for the Rochester *Union and Advertiser*, became managing editor of the Buffalo *Courier* in 1897, and after a course in law was admitted to the bar in 1899. He has published *Gallops*, a collection of fox-hunting sketches reprinted from the *Century.*

GRAY, Elisha, d.sc.: inventor: b. Barnesville, Ohio, 1835, Aug. 2; d. 1901, Jan. 21. He served apprenticeships at blacksmithing, carpentering, and boat-building; studied physical science at Oberlin College, and made mechanical appliances for class-room demonstrations; and received his first patent for telegraphic apparatus 1867, Oct. The principal of his other patents, which aggregate about 50, are for the speaking telephone (1876, Feb.); and the multiplex telegraph (1877, Jan.), by which he sent four messages at the same time on one wire between New York and Boston, and eight messages similarly between N. Y. and Philadelphia. He was author of *Experimental Researches in Electro-Harmonic Telegraphy and Telephony* (N. Y. 1878).

GRAY, Francis Calley, ll.d.: 1790, Sep. 19—1856, Dec. 29; b. Salem, Mass.: lawyer. He graduated at Harvard College 1809, was admitted to the bar, was private sec. to John Quincy Adams while U. S. minister to Russia, and became a member of the Mass. legislature and cor. sec. of the Acad. of Arts and Sciences. He bequeathed $50,000 for the establishment and sup-

port of a museum of comparative zoology in connection with Harvard, and also a collection of 3,000 rare engravings and $16,000 for cataloguing and keeping it in order. He was pres. of the Boston Athenæum, fellow of Harvard, contributor to the *North American Review*, and author of *Prison Discipline* (Boston 1847).

GRAY, GEORGE: an Amer. jurist; b. New Castle, Del., 1840, May 4. Was atty.-gen. of Delaware 1879–85; U. S. senator, 1885–99; became judge of U. S. Circuit Court of 3rd dist. in the latter year; appointed a member of Peace Commission in Paris, 1898; became president of Joint High Commission at Quebec, 1898, a member of International Commission of Arbitration under the Hague Convention 1900; and chairman of the Anthracite Coal Strike Commission, 1902.

GRAY, HENRY PETERS: 1819, June 23—1877, Nov. 12; b. New York: painter. He studied painting with Daniel Huntington in New York and in the leading European art galleries, lived in New York 1847–72 and Italy 1872–75, made a specialty of portraits and classical subjects, and was pres. of the National Acad. of Design 1869–74. He was an artist of great industry and painted about 300 portraits besides *Wages of War*, *Hagar and the Angel*, *Cleopatra*, *Charity*, *St. Christopher*, *The Immortality of the Soul*, *Greek Lovers*, *Twilight Musings*, *Normandy Girl*, *Pride of the Village*, and *Apple of Discord*.

GRAY, HORACE: associate justice U. S. Sup. Court; 1829–1902, Sep. 15; graduated at Harvard Col. 1845, and its law school 1849, was admitted to the bar 1851, appointed reporter of the Mass. supreme court 1854, and served till 1862, was associate justice of the Mass. supreme court 1864, Aug. 23—1873, Sep. 5, and chief justice 1873–1881, Dec. 19, when he was appointed successor to Judge Clifford in the U. S. supreme court. Was in charge of the 1st judicial dist., comprising dists. of Me., N. H., Mass., and R. I.

GRAY, JOHN EDWARD, PH.D.: 1800–1875, Mar. 7; b. Walsall, Staffordshire: English naturalist. He was educated for the medical profession. In 1821, he assisted his father (author of *Supplement to the Pharmacopœia*, and other works) in the preparation of his *Natural Arrangement of British Plants*, in which, for the first time in the English language, the new method was adopted. In 1824, Gray entered the British Museum as assistant in the nat. hist. dept., where he found scope for his extensive knowledge and accurate observation; and from 1840 till his death he was keeper of the zoological collections: these, the most complete in the world, are a monument of his persevering activity. His success was due partly to his quickness in seizing the peculiar characteristics of animal forms, which rendered him a good classifier. The Royal Bavarian Acad. of Sciences at Munich recognized his

services to science by conferring on him the title of PH.D. Dr. Gray wrote much on subjects connected with his department. The mere titles of his books and papers make a long list, numbering more than 500. His zoological and natural history catalogues are not mere lists, but are enriched with synonyms and ample notes, whereby study of particular subjects is greatly promoted. Dr. Gray assisted in the formation of some of the most prosperous scientific societies of London. He, moreover, claimed to have anticipated Sir Rowland Hill in his proposal for a low uniform rate of postage. He died at his residence in the British Museum.

Dr. Gray's principal works are: *Illustrations of Indian Zoology*, 2 vols. folio; *The Knowsley Menagerie*, 2 vols. folio; *Spicilegia Zoologica—on Mammalia, Birds, Reptiles, Fishes, Mollusca, Shells; Synopsis of the Contents of the British Museum;* besides catalogues of the specimens in the zoological dept. which have greatly facilitated the study of those collections. He also wrote many valuable scientific papers, in *Philosophical Transactions, Transactions of the Linnæan Society, Encyclopædia Metropolitana, Annals of Natural History*, and *Reports of the British Association.*

In 1826, Dr. Gray married a lady who rendered him important aid in his studies, and is known as author of *Figures of Molluscous Animals, for the Use of Students*, five vols. In 1832, he was elected a fellow of the Royal Soc., and afterward served on the council. He was a member of some of the principal societies and academies in England and on the continent. His brother, GEORGE ROBERT GRAY (1838–72), officer in the zoological dept. of the British Museum from 1831 till his death, was the author of many memoirs on zoology, but is best known as author of *The Genera of Birds:* his list comprises more than 2,900 genera, and 11,660 species.

GRAY, ROBERT: 1755–1806; b. Tiverton, R. I.: navigator. He was bred to the sea, became capt. of the sloop *Washington* fitted out by Boston merchants to trade with the natives of the n.w. coast, sailed 1787, Sep. 30, and returned 1790 by way of Canton, China, having circumnavigated the globe—the first man to carry the American flag around the world. During a second voyage in the ship *Columbia* he discovered and named the Columbia river 1791, May 11.

GRAY, THOMAS: English poet: 1716, Dec. 20—1771, July 30; b. London. His father, Philip Gray, a money scrivener, was of a disposition so violent, that his wife was obliged to separate from him; and it was mainly through her exertions that her son was placed at Eton, and afterward at Cambridge. At Eton, he made the acquaintance of Horace Walpole, son of the prime minister; and when his college education was completed, he accompanied his friend on a tour through France and Italy. After spending a year in the search of the

picturesque and in the exploration of picture-galleries, the friends quarrelled, and Gray returned to England, and went to Cambridge to take his degree in civil law. At the university, the greater portion of his life was spent, breathing the serene air of noble libraries, and corresponding with friends, after the style of the men of that day. In 1756, in consequence of a practical joke, he removed from St. Peter's College to Pembroke Hall. He had a just appreciation of the natural beauty of his native country, and rambled in Scotland, Wales, and the English lake counties—making notes and writing copious descriptions. He published *Ode to Eton College*, 1747, and *Elegy written in a Country Churchyard* two years afterward. His *Pindaric Odes* appeared 1757, but though brilliant in imagery, and charming the ear with involved and intricate harmony, they did not touch the popular heart like the *Elegy*. On the death of Colley Cibber, he was offered, but declined, the post of poet-laureate. Shortly afterward he was appointed prof. of modern history. Fastidious in his tastes, fond of books and lettered ease, indisposed to mingle in the great world, but delighting to comment upon it in letters to friends, blessed with a reputation peculiarly dear to a scholar's heart, comparatively rich, his life glided on imbittered but by one enemy—gout. Dining one day in the college hall, he was severely attacked, and after suffering a week, he died aged 55 years. He was buried by the side of his mother at Stoke near Eton. Gray's poetry, with the exception of the *Elegy*—which everybody knows—has never become popular; yet in its own sphere it is nearly perfect; delicately imaginative, curiously studded with imagery; exquisitely finished, like miniatures on ivory. But Gray's subjects are often remote, and out of the track of ordinary human feelings. The best life is that by Gosse (1882).

GRAYLING, n. *grā'lĭng* [corruption of *gray-lines*, referring to the dusky streaks along the body], (*Thymallus vulgaris*): fish allied to the trout, of the family *Salmonidæ*, and of a genus distinguished from salmon, trout, etc., by smaller mouth and much smaller teeth, and by the greater size of the dorsal fin. The scales are also much larger. The grayling is found in many streams in England, but is, however, very local; and of two rivers in the same neighborhood, one may contain it, and the other not. A supposition that it was brought to England by the monks is unsupported by any evidence. It is plentiful in many parts of Europe, and equally in Switzerland and in Lapland. It is abundant in Scandinavian rivers; also in the n. of Asia and America. It is known in Germany as the Asch or Aesche, in France *Ombre* ('shadow,' from its quick elusive movement), in Upper Italy *Temola*. It inhabits clear streams, with rocky or gravelly bottoms, and 'seems to require an alternation of stream and pool.' It will live in clean newly-made ponds in hard soil, though it

does not breed in them, but will not live in those of muddy bottom. Its food consists chiefly of flies and aquatic larvæ, and it is taken by angling in the same manner as the trout. It very rarely attains a weight of four pounds. The back and sides are silvery gray, marked with numerous longitudinal dusky streaks; the dorsal fin is spotted, the spots arranged in lines across the fin. The abdominal line is almost straight, the dorsal line considerably elevated. The grayling is greatly esteemed for the table, but requires to be cooked when newly caught, when it has an odor which has been compared to that of wild thyme. It spawns in April or May, and is in the best condition when trout are out of season, in Oct. and Nov.—There are several other species of *Thymallus:* one *T. signifer*, a very beautiful fish, inhabiting the clear affluents of the Mackenzie river, British America, is called *Hewlukpowak*, or the *fish with the winglike fin*, by the Esquimaux. It is said to afford excellent sport to the angler; though the streams in which it is found are visited by few anglers for amusement. Angling for grayling is excellent sport. It rises to the same flies as those used for trout: it takes also worms, maggots, and other small larvæ and insects. From July till the end of Oct. is the best season for the fishing, but in fine open days the sport may be had through the winter.

GRAY'S INN: one of the four Inns of Court in London, having the sole power of calling persons to the degree of barrister-at-law. See INNS OF COURT.

GRAYSON, *grā'son*, WILLIAM: d. 1790, Mar. 12; b. Prince William co., Va.: legislator. He graduated at Oxford Univ., studied law at the Temple, London, and settled in Dumfries, Md., to practice. In 1776 he was appointed aide-de-camp to Washington, 1777 col. of a Va. regt., 1778 distinguished himself at the battle of Monmouth, 1780–1 was a member of the board of war, 1784–87 member of the continental congress, 1788 member of the Va. convention which adopted the Federal constitution, and 1789 till his death a senator in the 1st congress.

GRAY'S PEAK: elevation of the Rocky Mountains in Summit and Clear Creek cos., Colo., on the e. border of the Middle Park, lat. 39° 38′ n., long. 105° 48′ 46″ w., 12 m. w. of Georgetown, 48 m. w. of Denver, height 14,466 ft. It was named in honor of Prof. Asa Gray, as its twin of the same height was named for Prof. Torrey. Its sides are covered with forests of large evergreen trees.

GRAYWACKE, *grā'wăk-ĕ:* partially translated German word (*grauwacke*), formerly used to denote an indurated argillaceous rock, conglomerate of rounded pebbles and sand, common in, though not confined to, the Silurian and Cambrian strata: the term has almost passed out of use.

GRAZE, v. *grāz* [Ger. *ksatzen*, to scratch: Icel. *krassa*, to scratch, to tear: F. *raser*, to shave (see GRATE 2)]: to rub or brush lightly anything in passing; to touch and glance from, leaving a very superficial wound. GRA'ZING, imp. GRAZED, pp. *grāzd*.

GRAZE, v. *grāz* [AS. *grasian*, to graze—from *græs*, grass: Dut. *grazen*, to graze]: to furnish pasture for; to feed on grass; to supply grass. GRA'ZING, imp.: ADJ. supplying pasture; feeding on grass: N. the act of feeding on grass; a pasture. GRA'ZER, n. an animal which grazes. GRAZIER, n. *grā'zhẽr*, one who pastures cattle and rears them for market.

GRAZIOSO, ad. *grăt'zĭ-ō'zō* [It.]: in *music*, an intimation to perform the music smoothly and gracefully.

GRAZZINI, *grât-zē'nē*, ANTON FRANCESCO: 1503, Mar. 22—1583, Feb. 18; b. Florence, Italy: author. Nothing is known of his early life excepting that he carried on the apothecary's business, but his name is famous in the literature of Italy. He was founder of the Academy of the Humid 1540, and of the Accademia della Crusca 1582, and in both he was usually spoken of as IL LASCA or LEUCISCUS, and engaged in many literary quarrels. His chief works are *La Cene*, a collection of stories on the Boccaccian plan, and many prose comedies, including *La Gelosia*, *La Spiritata*, *La Arenga*, *La Sibilla*, and *I Parentadi*. He also is known to have edited the works of Berni.

GREAL, n. *grël*. See GRAIL.

GREASE, n. *grēs* [It. *grascia*, grease: F. *gras;* OF. *cras*, fat—from mid. L. *crassus*, thick, fat: F. *graisse*, grease: Gael. *creis*, grease]: soft animal fat, as tallow or lard. GREASE, v. *grēz*, to smear, rub, or anoint with fat. GREASING, imp. *grē'zĭng*, smearing with fat or oily matter. GREASED, pp. *grēzd*. GREASY, a. *grē'zĭ*, oily; of or like grease; smeared or covered with grease. GREASILY, ad. *grē'zĭ-lĭ*. GREA'SINESS, n. *-zĭ-nĕs*, oiliness; fatness.

GREASE, n. *grēs* [F. *graisse;* It. *grascia*, grease]: a disease in horses, consisting of inflammation of the skin at the back of the fetlock and heels, on which pustules form, yielding a fetid, purulent discharge.

GREASE: term of general application to all oily or fatty matters, but generally to those having some degree of solidity, as tallow. It is specially applied to fatty matters which are so deteriorated with dirt or other impurities as to be unfit for candle-making and other manufactures requiring some degree of purity in the material. Grease is largely employed as a lubricant for machinery, especially for wheels of carriages. Grease for the axles of carriages and carts consists of the most inferior kinds of grease mixed with a little tar. In commerce, the term Mares' Grease denotes the fat of horses (chiefly mares) which are killed in large numbers at

Buenos Ayres and Monte Video: their products, consisting of hides, grease, bones, and hair, are largely exported. It is a very oily fat, and so penetrating that there is difficulty in making casks sufficiently tight to prevent leakage. It is well adapted for lubricating machinery.

Locomotive Grease is, in reality, a kind of soap, a small portion of soda being mingled with the materials to effect an imperfect saponification. The object is to prevent the too rapid melting of the material, which, without this precaution, would be excessively rapid, owing to the heat caused by the friction of the wheels revolving with such rapidity. It is made of the best materials, and consists generally of the vegetable fats called cocoa-nut oil and palm-oil; sometimes animal fat is used. This composition is placed in small metal boxes on the axles, with which they communicate by a small hole, so that, as the axle heats the surrounding parts, the grease in the boxes melts, and runs through the little orifice on to the axle. Oil is the lubricator for the delicate parts of the locomotive but grease is necessary for the axles of the wheels. So vast is the quantity used, that the annual demand amounts to many thousands of tons; and, as the quality is very important, most of the great railway companies make their own—establishing a marked distinction between the two kinds used for locomotives and for wagons. Locomotive grease usually consists of tallow, oil, carbonate of soda and water. Much depends on the consistency. If the grease is too thick, the axle-boxes become hot; if too thin it is used up too quickly. Again, if there is too much alkali, a residue is left in the boxes; if too little, the grease is too soft and wasteful. The grease is always yellow; but it is made of thinner consistency for cold weather than for hot. The following are given as the constituents of two approved kinds, to produce one ton of each kind, allowing a certain percentage for waste:

	WINTER.			SUMMER.		
	cwts.	qrs.	lbs.	cwts.	qrs.	lbs.
Tallow	3	3	0	4	2	0
Palm-oil	2	2	0	2	2	0
Sperm-oil	0	1	7	0	0	27
Alkali	1	0	14	1	0	8
Water	12	3	12	12	0	26

The manufacture is very simple. The tallow and oils are heated to 180° F.; the water and alkali to 200°; both are run off into wooden tubs, where they are well stirred till cold, with special precautions against the admission of any grit or dirt.

Wagon Grease is coarser and cheaper in quality. The ingredients are chiefly some kind of resinous oil and caustic lime. When resin is cheap, wagon grease costs about half the price of locomotive grease, and is useful also for low-speed locomotives. The increase in price of resin during the civil war led to attempts to use residues from paraffin, coal-tar, candle-making, cotton seed oil, fish-oil, pitch oil, and other substitutes. See BEAR'S GREASE.

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